Technical Paper No. 463

Local and Traditional Knowledge of Chilkat Chinook Salmon

by
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and
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February 2022

Alaska Department of Fish and Game **Division of Subsistence**

Symbols and Abbreviations

The following symbols and abbreviations, and others approved for the Système International d'Unités (SI), are used without definition in Division of Subsistence reports. All others, including deviations from definitions listed below, are noted in the text at first mention, in the titles or footnotes of tables, and in figures or figure captions.

Weights and measures (metric)

centimeter	cm
deciliter	dL
gram	g
hectare	ha
kilogram	kg
kilometer	km
liter	L
meter	m
milliliter	mL
millimeter	mm

Weights and measures (English)

cubic feet per second	ft^3/s
foot	ft
gallon	gal
inch	in
mile	mi
nautical mile	nmi
ounce	oz
pound	lb
quart	qt
yard	yd

Time and temperature

day	d
degrees Celsius	°C
degrees Fahrenheit	°F
degrees kelvin	K
hour	h
minute	min
second	s

Physics and chemistry

all atomic symbols	
alternating current	AC
ampere	A
calorie	cal
direct current	DC
hertz	Hz
horsepower	hp
hydrogen ion activity (negative log of)	pH
parts per million	ppm
parts per thousand	ppt, ‰
volts	V
watts	W

General

Alaska Administrative Code	AAC
all commonly-accepted abbreviations	e.g., Mr., Mrs., AM, PM, etc.
all commonly-accepted professional titles	e.g., Dr., Ph.D., R.N., etc.
at	@
compass directions:	
east	E
north	N
south	S
west	W
copyright	©
corporate suffixes:	
Company	Co.
Corporation	Corp.
Incorporated	Inc.
Limited	Ltd.
District of Columbia	D.C.
et alii (and others)	et al.
et cetera (and so forth)	etc.
exempli gratia (for example)	e.g.
Federal Information Code	FIC
id est (that is)	i.e.
latitude or longitude	lat. or long.
monetary symbols (U.S.)	$, ¢
months (tables and figures)	first three letters (Jan,...,Dec)
registered trademark	®
trademark	™
United States (adjective)	U.S.
United States of America (noun)	USA
U.S.C.	United States Code
U.S. states	two-letter abbreviations (e.g., AK, WA)

Measures (fisheries)

fork length	FL
mideye-to-fork	MEF
mideye-to-tail-fork	METF
standard length	SL
total length	TL

Mathematics, statistics

all standard mathematical signs, symbols and abbreviations	
alternate hypothesis	H_A
base of natural logarithm	e
catch per unit effort	CPUE
coefficient of variation	CV
common test statistics	(F, t, χ^2, etc.)
confidence interval	CI
correlation coefficient (multiple)	R
correlation coefficient (simple)	r
covariance	cov
degree (angular)	°
degrees of freedom	df
expected value	E
greater than	>
greater than or equal to	≥
harvest per unit effort	HPUE
less than	<
less than or equal to	≤
logarithm (natural)	ln
logarithm (base 10)	log
logarithm (specify base)	$\log_2$, etc.
minute (angular)	'
not significant	NS
null hypothesis	H_O
percent	%
probability	P
probability of a type I error (rejection of the null hypothesis when true)	α
probability of a type II error (acceptance of the null hypothesis when false)	β
second (angular)	"
standard deviation	SD
standard error	SE
variance:	
population	Var
sample	var

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February 2022

The Division of Subsistence Technical Paper Series was established in 1979 and represents the most complete collection of information about customary and traditional uses of fish and wildlife resources in Alaska. The papers cover all regions of the state. Some papers were written in response to specific fish and game management issues. Others provide detailed, basic information on the subsistence uses of particular communities which pertain to a large number of scientific and policy questions.

Technical Paper series reports are available through the Alaska Resources Library and Information Services (ARLIS), the Alaska State Library, and on the Internet: http://www.adfg.alaska.gov/sf/publications/. This publication has undergone editorial and professional review.

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ABSTRACT

The Chilkat River drainage produces one of the largest runs of Chinook salmon in Southeast Alaska. Like other Chinook salmon stocks in Alaska, the Chilkat River Chinook salmon stock has been in decline. This project sought to document the detailed knowledge held by commercial and subsistence fishers, gathered over decades of observing the marine and freshwater environments, to help explain why the Chilkat River Chinook salmon run is in decline and seek suggested potential solutions or additional avenues of research. The project was a part of the statewide Alaska Chinook Salmon Research Initiative, which was a multi-year initiative to fund a variety of statewide research projects based on the understanding that Chinook salmon declines have caused hardships across many communities in rural and urban Alaska. Through an analysis of key respondent interviews with 36 individuals, all having participated in either the commercial or subsistence fisheries, several themes emerged: the importance of subsistence and commercial salmon fishing; use of commercially caught salmon retained for home use; local knowledge of Chinook salmon habitat, migration, abundance, and health; reasons for Chinook salmon declines; and perspectives on management solutions. Recommendations for future research and management actions are provided.

Key words: Chinook salmon, king salmon, local traditional knowledge, Chilkat River, Chinook Salmon Research Initiative

1. INTRODUCTION

The Chilkat River drainage produces one of the largest runs of Chinook salmon *Oncorhynchus tshawytscha* in Southeast Alaska (Chapell 2014). This large glacial system has its headwaters in British Columbia, Canada, and empties into Chilkat Inlet near Haines, Alaska (Figure 1-1). Residents of the communities of Haines and Klukwan are the main users of the river. The population of Haines census designated place (CDP) was an estimated 1,811 people, and 84 people in Klukwan CDP, for 2014, which is along the timeframe of when this study was conducted (ADLWD 2019). Three main fisheries harvest Chilkat Chinook salmon in upper Lynn Canal: a marine sport fishery, a marine and freshwater subsistence fishery, and a marine commercial gillnet fishery. This study focused on the commercial and subsistence fishers who spend multiple days on the water every year harvesting salmon for their livelihood and their food. The research did not focus on individuals who consider themselves primarily sport fishermen, although many of the commercial and subsistence fishermen also participate in the sport fishery.

Chinook salmon are one of the first species of salmon to arrive in the Chilkat River after the eulachon *Thaleichthys pacificus* run. Traditionally, Chinook salmon were "eagerly sought as the year's first fresh salmon" (Mills et al. 1984:23). Fishing practices of Haines and Klukwan subsistence and commercial fishers have been influenced by changes in demography, ecology, transportation technology, population growth, and many other sociocultural, environmental, and economic factors. These fishers hold detailed knowledge from decades of observing the marine and freshwater environments and each species in them. This project documented this knowledge to provide information about why the Chilkat River Chinook salmon run has been declining and to seek suggested potential solutions or additional avenues of research.

The Alaska Department of Fish and Game (ADF&G) Division of Subsistence is charged with gathering, quantifying, evaluating, and reporting information about customary and traditional uses of fish and wildlife resources. The results presented within this report provide insight into the local and traditional knowledge held by Klukwan and Haines fishers about salmon and their use of the resource.

Project Background

This study was part of the State of Alaska Chinook Salmon Research Initiative (CSRI) program, an effort to help state and federal resource management agencies better understand the factors affecting Chinook salmon abundance in Alaska. The CSRI program was a multi-year initiative to fund a variety of statewide research projects based on the understanding that Chinook salmon declines have caused "social and economic hardships across many communities in rural and urban Alaska" (ADF&G Chinook Salmon Research Team 2013:1). Chinook salmon have been returning to many Alaska rivers in lower numbers, with widespread shortfalls first becoming apparent in 2007. ADF&G hosted a symposium to identify knowledge gaps and research needs concerning salmon, the result of which was the *Chinook Salmon Stock Assessment and Research Plan* (ADF&G Chinook Salmon Research Team 2013). In the plan, 12 watersheds, based on existing Chinook salmon indicator stocks, were chosen for recommended research, including the Chilkat River. This plan was formed in 2013 and recommended, "A study of local and traditional knowledge [LTK] of the Chilkat River Chinook salmon stock." The recommended LTK research would complement two additional recommended research components: adult mark-recapture and age, sex, and length sampling research, as well as annual coded-wire-tagging of juveniles with fishery and escapement recaptures, both of which were to improve stock escapement/inriver abundance and smolt assessments (ADF&G Chinook Salmon Research Team 2013:23, 45).[1]

This study employed key respondent interviews to document LTK, which was identified as a source of "detailed observations about abundance, distribution, run timing, condition, and habitat, often focused on specific locations and informed by considerable time depth" (ADF&G Chinook Salmon Research Team 2013:16). The following research questions were developed to help guide the project:

1. These studies are underway, but results had not been published at the time of this report's publication. Regional operational plans are available for the research, however: see Elliott (2018) and Elliott and Peterson (2018).

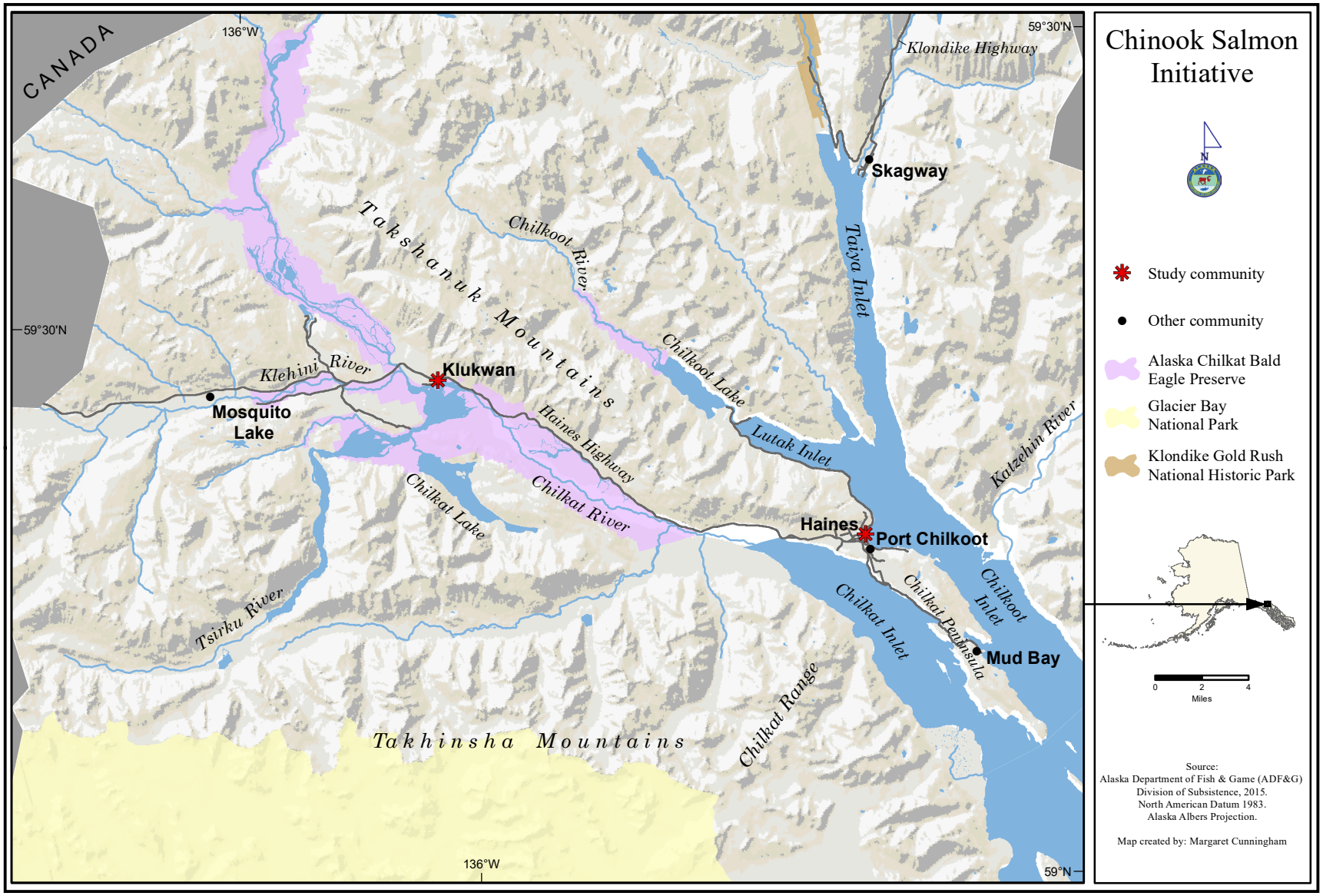


Figure 1-1.–Map of study communities.

- What observations have commercial gillnetters and marine and freshwater subsistence fishers out of Haines and Klukwan made over the course of their lifetimes in regard to the Chilkat Chinook salmon run in Lynn Canal and the Chilkat River?
- Does the knowledge held by area fishers correlate with the data collected by area biologists and managers?

Regional Background

Lynn Canal is an inlet that spans approximately 90 miles from Chatham Strait and Stephens Passage in the south to the Chilkat River in the north. Upper Lynn Canal consists of the Chilkat, Chilkoot, Lutak, and Taiya inlets. There are three communities in this area: Klukwan, Haines, and Skagway. Haines and Klukwan are at the head of Chilkat Inlet, while Skagway sits by Taiya Inlet (Figure 1-1). Skagway, with a history and development distinct from Haines and Klukwan, and whose residents generally do not rely on Chilkat River stocks, was not included in this research.

Haines is located on the mainland at the head of Lynn Canal and between Chilkoot and Chilkat inlets. Klukwan is situated on the north bank of the Chilkat River just downriver of the confluence of the Chilkat and Klehini rivers, approximately 22 miles upriver from the community of Haines. The mainland in this area is mountainous terrain bisected by the Chilkat River watershed. The Chilkat River and the smaller Chilkoot River are glacially fed, lake-associated rivers that are rich in fish resources. The region falls within the southeast maritime climate zone but has a more continental climate than the island-based communities throughout much of Southeast Alaska. The study communities are just south of the Canadian border at British Columbia. The Haines Highway provides a link between the Alaska Marine Highway System and the Alaska Highway at Haines Junction in the Yukon Territory, Canada.

Humans have inhabited Southeast Alaska for at least 9,000 years (Sackett 1979). The chronology of Tlingit occupation of the land is less well-established, likely dating to 2,000–4,000 years ago (Langdon 2013rev.). Tlingit settlement of the Chilkat region is thought to have occurred later, as Tlingit migrated northward from southern Southeast Alaska (Sackett 1979). Within the Chilkat River area, Tlingit oral history describes several major and minor permanent villages, as well as some seasonal subsistence camps, especially for harvesting and processing eulachon and salmon (Emmons 1991; Krause 2013; Swanton 1908). The Tlingit of this area were historically divided into two regional groups: the Chilkat and the Chilkoot. The Chilkat territory included the Chilkat River valley, the west side of Lynn Canal to northern Berners Bay, and land and water routes into Interior Alaska. The Chilkoot territory included Chilkoot lake and river, Lutak Inlet, Taiyasanka Harbor, the east side of northern Lynn Canal, and the area around Dyea. Tlingit clans recorded as occupying Haines and Klukwan in the late 1800s were the Raven G̲aanax̲teidí, G̲aanax̲. ádi, Lukaax̲.ádi, Naach'ooneidí, and Noowshaka.aayí and the Eagle Kaagwaantaan, Dagisdinaa, Dak̲l'aweidí, and Shangukeidí (Hope et al. 2000:150–151; Thornton and Sealaska Heritage Institute 2008:48–51). Contemporarily, both the Chilkat and the Chilkoot Tlingit are federally recognized tribes, headquartered in Klukwan and Haines, respectively.

Like elsewhere in Southeast Alaska, Tlingit in the Chilkat area had access to a wide variety of resources in their home territory, including bountiful and varied fish stocks, but they also enjoyed proximity to the resources of the Interior through Athabascan and Southern Tutchone trading partners (de Laguna 1990). Residents of these communities fished all along the Chilkat River and processed salmon at camps and in the villages while using other hunting, trapping, and gathering locations throughout the area. Through their knowledge of the river system and abundant marine resources, the Chilkat and Chilkoot Tlingit were able to participate in an extensive system of exchange with the Interior and coastal peoples by trading eulachon oil, salmon, and other coastal products for furs, copper, jade, and other goods from the Interior, as well as dentalia shells, Chilkat blankets, enslaved people, and other goods from the coast (Oberg 1973). The

exchange of eulachon oil was a particularly significant trade activity, and the local Tlingit created and used a portion of the network of these "grease trails"[2] where eulachon oil was carried into Interior Alaska.

Contact with European explorers came in the late 1700s when French, Russian, Spanish, and British ships arrived at Yakutat. In 1794, British captain George Vancouver ventured into Lynn Canal and encountered the Chilkat and Chilkoot Tlingit (Cerveny 2004). Until the 1880s, trading ships increasingly frequented the area, with control of the major passes into the interior of the continent maintained by the Tlingit. A Presbyterian minister, S. Hall Young, traveled to one of the Chilkat villages in 1879 to discuss the establishment of a Presbyterian mission (Sackett 1979). One of the smaller village sites, Deishu, was selected for the mission site, and was later renamed Haines. The mission helped to consolidate the area villages into the community of Haines. In the early 1880s, the commercial fishing industry built several canneries in Chilkat Inlet near Haines, and in the late 1890s the Klondike gold rush brought thousands of prospectors to the town. The Dalton Trail was established as an open access route into the interior area in the 1890s (Cerveny 2004).

Haines incorporated as a city in 1910 and as a third-class borough in 1968 (Sill and Koster 2017). The City of Haines and the Haines Borough were consolidated into a home-rule borough in 2002. While much of the borough population outside of the CDP of Haines is scattered, there are settlement clusters at Mud Bay, Covenant Life, Lutak, Mosquito Lake, and Excursion Inlet. In 1942, the Haines Highway into Interior Alaska was completed; later, in the 1950s, the Alaska Marine Highway System also provided a link between Haines and other Southeast Alaska locations. Tourism and the logging industry became increasingly important economic mainstays for Haines, as well as commercial gillnet, troll, and crab fisheries. Haines has been attracting a growing summer seasonal population, as well as cruise ship landings (Cerveny 2004).

In 2014, in addition to road and ferry access, two airlines served the Haines community with regularly scheduled flights to Juneau. The Haines School District operated a K–12 school in Haines to serve the residents of the borough. The federally recognized Chilkoot Indian Association maintained a local office in town. A health clinic and post office served residents of the borough, as well as the neighboring community of Klukwan. There were hotels, varied restaurants, and two grocery stores. Several state agencies, including ADF&G, maintained offices in Haines.

Unlike Haines, Klukwan did not develop as a transportation, commercial, or service center. Klukwan residents were involved with Haines mission activities and the commercial salmon industry around the turn of the 20th century, and most services were obtained from Haines. Non-Native settlement in the community of Klukwan has remained minimal. Klukwan was established as an Indian reservation by a 1913 U.S. executive order (Executive Order No. 1764) and the reservation was enlarged and confirmed by Congress in 1957 (Pub. L. 85-271. 71 Stat. 596. Sept. 2, 1957). Four additional executive orders for protecting subsistence fisheries on the Chilkat River were established between 1913 and 1918 (Gorsuch et al. 1994:49). The passage of the Alaska Native Claims Settlement Act (ANCSA) in 1971 extinguished those reservations (Case and Voluck 2012:109).[3] Klukwan formed an Indian Reorganization Act (IRA) council—the Chilkat Indian Village—in the 1930s, which provides most services in town. In 2014, there was a local clinic, school, community library, and a cultural heritage center. The Chilkat Indian Village oversees subsistence management concerns by community residents. Klukwan is unincorporated. The ANCSA village corporation, Klukwan, Inc., has provided local employment and income through its development of logging operations.

2. Eulachon only run in certain rivers in Southeast Alaska and British Columbia, but the oil processed from the fish was highly prized by many groups of people, some living far from the eulachon runs. The trade routes in coastal British Columbia and Southeast Alaska came to be called grease trails because of the importance of the eulachon oil that was carried over them (MacKinnon 2015; Oberg 1973:109).
3. In 1976, Congress amended ANCSA "to select a township under ANCSA if it conveyed the lands of the former reserve in fee to the Chilkat Indian Village tribal government." The Chilkat Indian Village does currently own land in trust, as do some individual Klukwan residents (Case and Voluck 2012:172).

Klukwan and Haines residents participate in the Upper Lynn Canal Fish and Game Advisory Committee (there is also a Klukwan Fish and Game Advisory Committee, inactive since 2009) and are represented on the federal Southeast Alaska Subsistence Regional Advisory Council.

Regulatory Context

In Southeast Alaska, the harvest of Chinook salmon, whether targeted or incidental, is broadly managed under the auspices of the *Pacific Salmon Treaty* (5 AAC 29.060). Chilkat River Chinook salmon are only targeted directly by a small, terminal marine recreational fishery, which usually includes a fishing derby. Chinook salmon are incidentally caught in other marine recreational fisheries, marine and freshwater subsistence sockeye salmon *O. nerka* fisheries, and marine commercial salmon fisheries (drift gillnet in Lynn Canal, troll and purse seine throughout Southeast Alaska). Specific management measures for subsistence, commercial, and sport fisheries in Lynn Canal, based on achieving inriver Chinook salmon goals, are delineated in the *Lynn Canal and Chilkat River Chinook Salmon Management Plan* (5 AAC 33.384). Other regulations specific to each fishery also apply.

Under the Alaska state constitution, any resident of the state is eligible to participate in subsistence fishing in the Haines Management Area (state-managed District 15 waters). There are no federal lands or waters in the immediate vicinity of Haines and Klukwan, therefore no federal salmon subsistence regulations guide harvesting practices. The Alaska Board of Fisheries made a positive customary and traditional (C&T) use determination for salmon harvested in the Chilkat River and in portions of the Chilkoot River, Lutak Inlet, and Chilkoot Inlet (5 AAC 01.716(a)(13)) and found that the amount reasonably necessary for subsistence (ANS) in District 15 is 7,174–10,414 salmon (5 AAC 01.716(c)).

In the Haines Management Area, a state subsistence permit is required for subsistence harvests of salmon, trout, Arctic char *Salvelinus alpinus*, Pacific herring *Clupea pallasi* spawn on kelp, and sablefish *Anoplopoma fimbria* (5 AAC 01.730). To subsistence fish for Pacific halibut *Hippoglossus stenolepis*, a qualified person can obtain a federal Subsistence Halibut Registration Certificate (SHARC). Within the Haines Management Area, salmon may be harvested under personal use regulations only in the Taiya River and only pink *O. gorbuscha* and chum *O. keta* salmon may be taken. In the combined waters with a positive C&T determination, the following possession and annual limits apply: for sockeye salmon, a possession limit of 25 fish and an annual limit of 50 fish; for coho salmon *O. kisutch*, a possession limit of 20 fish and annual limit of 40; and for pink and chum salmon, combined, a possession limit of 75 fish and an annual limit of 100 (5 AAC 01.745(i)). Permits are not issued for the harvest of Chinook salmon; however, any Chinook salmon caught incidentally may be retained (5 AAC 01.730((b)). In 2014, the subsistence permit provided for an open season of June 1–September 30 (see Figure 1-2). Subsistence salmon fishing is closed in the salt waters of Lynn Canal during closed periods of the commercial salmon net fishery, except subsistence fishing is allowed in a portion of these waters the Saturday before and the day before any commercial drift gillnet openings in the waters of Section 15-A. In 2012–2019, fisheries managers, through emergency orders, implemented time and area closures for the subsistence fishery in an effort to reduce harvests of Chilkat River Chinook salmon (Lum and Fair 2018).[4, 5]

Allowable gear types in the Haines Management Area subsistence fishery are set and drift gillnets. This gear may be used to take salmon in the mainstem and side channels, but not in the tributaries of the Chilkat River from Mile 4 of the Haines Highway to one mile upstream of Wells Bridge. Drift and set gillnets may not exceed 50 ft in length when fishing in the Chilkat River, and drift gillnets fished in marine waters may not exceed 300 ft in length.

4. Alaska Department of Fish and Game. 2018. "News Release: Closure of Subsistence Salmon Fishing Areas to Conserve Chilkat River King Salmon." http://www.adfg.alaska.gov/static/applications/dcfnewsrelease/909365911.pdf (accessed April 2020).
5. Alaska Department of Fish and Game. 2018. "News Release: Chilkat River Subsistence Salmon Fishing Closures." http://www.adfg.alaska.gov/static/applications/dcfnewsrelease/1033790613.pdf (accessed April 2020).

ALASKA DEPARTMENT OF FISH AND GAME
State Subsistence Salmon Permit
Haines Management Area - Phone: 766-2830

☐ **Duplicate Permit** **Permit Year 20_____**

Name: _____ DOB: _____

Mailing Address: _____

Physical Address: _____

City/State/ZIP Code: _____

Telephone #: _____ # of Persons in Household : _____

Community of Principal Residence: _____

Alaska Residency
(Actual number of years and months as a resident is required) _____Years_____Months
Determination of Residency (AS 16.05.415.); a "resident" means, a person who is physically present in Alaska with the intent to remain indefinitely and make a home here, has maintained that person's domicile in Alaska for the 12 consecutive months immediately preceding this application for a permit, and is not claiming residency or obtaining benefits under a claim of residency in another state, territory, or country.

Other Members in household authorized to fish this permit:

Name: _____ Name: _____

Proxy: Authorized Alternate Person Fishing if permit holder is blind, has physical disabilities, or is 65 years of age or older as per 5 AAC 01.011 (g) (1) (A).

Name: _____ Phone #: _____

Mailing Address: _____

City/State/ZIP Code: _____

Any departure from the permit conditions and guidelines may only be done with permission from the Area Management Biologists in the Haines ADF&G office.

Other as Specified: _____

Authorized By: _____

I understand that State of Alaska regulations are in effect, and I agree to abide by the permit conditions, harvest limits, seasons and to record daily harvests. I certify under penalty of perjury that to the best of my knowledge and belief the information I have provided on this permit application is true and correct. I understand that failing to comply with reporting requirements makes me ineligible to receive a permit during the following calendar year. (Note: Making a false statement, or omitting a material fact, is subject to a maximum penalty of $10,000 or 1 year imprisonment, or both, per AS11.56.210.)

_____ _____
Permittee Signature (not valid until signed) ***Date***

_____ _____
Department Representative (not valid until signed) ***Date of Issue***

General Permit Conditions

1. Only one permit may be issued to a household. The permittee, or other household members, may not obtain or possess more than one permit per household.
2. The permittee shall abide by all appropriate subsistence regulations of the State of Alaska found in 5 AAC 01 (Subsistence fishfish).
3. The permittee shall record harvests in numbers of fish for each day fished by species, gear type, and location directly on the harvest calendar on this permit, and before leaving the immediate vicinity where the harvest took place, even if no fish were harvested.
4. This permit must be returned to ADF&G by November 10, in the year in which the permit was issued.
5. The permittee must adhere to the subsistence and personal use fishing guidelines listed on this permit by location and species including: possession limits, annual limits, and season open dates.
6. When the department takes inseason action by emergency order to change open dates, open seasons, open areas, or possession limits by location, a news release will be issued announcing the changes. The permittee shall verify subsistence or personal use fishing guidelines in place before fishing by contacting the department or reviewing news releases issued.
7. Permit is valid only for the waters of Section 15-A in all waters of the Chilkat River and Chilkat Inlet north of the latitude of Glacier Point, and in Lutak Inlet and Chilkoot Inlet north of the latitude of Battery Point.
8. Set and drift gillnets are the type of gear allowed in the Haines Subsistence Fishery. Set and drift gillnets, may not be used to harvest salmon except in the mainstem and side channels, but not the tributaries of the Chilkat River from four-mile Haines Highway to one-mile upstream of Wells Bridge. Drift and set gillnets may not exceed 50 feet in length when fishing in the Chilkat River and drift gillnets fished in marine waters cannot exceed 50 fathoms in length. Salmon may not be harvested by the use of a line attached to a pole or rod.

SUBSISTENCE SALMON FISHING LIMITS AND SEASONS

Salmon Species	Limits		Season Open Dates	Location
	Possession	Annual		
Sockeye	25	50	June 1–Sept. 30	Chilkat River, Chilkat Inlet, Lutak Inlet
Coho	20	40	June 1–Sept. 30	Chilkat River, Chilkat Inlet, Lutak Inlet
Pink and/or Chum*	75	100	June 1–Sept. 30	Chilkat River, Chilkat Inlet, Lutak Inlet

**Total may be comprised of any combination of either species.*

This Permit MUST Be Returned to Alaska Department of Fish and Game Office
By November 10, in the year in which the permit was issued regardless of whether you fished or not.

Mark this box if you did not fish ☐

Figure 1-2.–Haines Management Area subsistence salmon permit in use in 2014.

Figure 1-2.–Page 2 of 2.

Place Stamp Here

Alaska Department of Fish and Game
Division of Commercial Fisheries
P.O. Box 330
Haines, Alaska 99827

Harvest Report: Record the <u>number</u> of fish caught daily.											**PROXY ONLY**
Month/Day	Stream Name	Gear Used	Sockeye	Pink	Chum	Coho	King	Steelhead	Rainbow/ Cutthroat	Dolly Varden	Estimated-Pounds

This Permit MUST Be Returned to Alaska Department of Fish and Game Office
By <u>November 10, in the year in which the permit was issued</u> regardless of whether you fished or not.

Under state regulations, rod and reel is not a legal gear type for subsistence harvests in the Haines Management Area; therefore, many residents also harvest fish for home use under sport fishing regulations. Possession limits in the sport fishery are set annually based on the projected abundance of Chinook salmon. In 2014, non-resident sport anglers had a bag limit of two Chinook salmon during May and June and a bag limit of one Chinook salmon the rest of the year, as well as a six-fish annual limit. Resident anglers operated with a three-fish bag limit and no annual limit (Chadwick et al. 2015). Only Chinook salmon equal to or greater than 28 inches in length could be kept.

In addition to harvesting salmon under sport and subsistence regulations, removing fish from a commercial catch for personal use is allowed under commercial fishing regulations (5 AAC 39.010) and can provide a significant source of fish.

During interviews, respondents described four commercial salmon fisheries that they thought affected Chilkat River Chinook salmon stocks. These are the gillnet fishery in District 15, the troll fishery within Southeast Alaska, the purse seine fishery that operates throughout much of Southeast Alaska but not in District 15, and the federally managed trawl fishery that operates beyond state waters. Each of the state-water fisheries is managed by ADF&G with a preseason management plan released each year, although the fisheries are managed inseason through emergency orders. Both the drift gillnet fishery and the purse seine fishery target pink salmon. In addition, the drift gillnet fishery also targets sockeye, chum, and coho salmon, while the seine fisheries target hatchery-origin chum salmon. There are three fishing seasons for trollers: spring, summer, and winter. The spring troll fishery targets hatchery Chinook and chum salmon; the summer fishery targets coho, Chinook, and chum salmon; and the winter fishery targets Chinook salmon. Several trawl fisheries occur in federal waters; of interest to respondents in this study were the trawl fisheries targeting groundfish that occur within the Gulf of Alaska (GOA). These fisheries are managed under the GOA *Groundfish Fishery Management Plan* (NPFMC 2019). Under this plan, Chinook salmon harvests are considered a Prohibited Species Catch, meaning they must be returned to the sea with minimum injury. Any Chinook salmon incidentally caught must be retained until an observer can count it and take biological samples. Each regulatory area has a Chinook salmon harvest cap and when the cap is reached, the fishery in that area is closed.

Study Objectives

The project had the following objectives:

- Document the knowledge held by Haines and Klukwan fishers regarding Chinook salmon migration, behavior, health, abundance, and habitat in the Chilkat River.
- Correlate the observations, knowledge, and perceived reasons for the Chinook salmon decline held by fishers with the data and reasons determined by biologists, managers, and statisticians.
- Describe fishers' foreseeable solutions to the Chilkat River Chinook salmon decline. What do participants in the commercial and subsistence fisheries perceive to be the best management strategy for the Chilkat River Chinook salmon stock in the future and how are these perceptions comparable to those of biologists and managers?
- Determine what other marine and freshwater species are changing and what can observations of these other species tell us about the Chinook salmon decline.
- Describe what changes in the marine and freshwater environment have occurred in the past, and are currently occurring, based on LTK, and ascertain whether fishers believe these changes are having an effect on the Chilkat Chinook salmon stock.

Research Methods

Ethical Principles for the Conduct of Research

The project was guided by the research principles outlined in the Alaska Federation of Natives *Guidelines for Research*[6] and by the National Science Foundation, Office of Polar Programs in its *Principles for the Conduct of Research in the Arctic* that were approved in 1990 (Social Science Task Force, U.S. Interagency Arctic Research Policy Committee 1995), the *Ethical Principles for the Conduct of Research in the North* (Association of Canadian Universities for Northern Studies 2003), as well as the Alaska confidentiality statute (AS 16.05.815). These principles stress community approval of research designs, informed consent, anonymity or confidentiality of study participants, opportunity for community review of draft study findings, and the provision of study findings to each study community upon completion of the research.

Project Planning and Approvals

Data for this report come from key respondent interviews (KRIs) conducted with residents of Haines and Klukwan. Additionally, ADF&G Division of Subsistence participated in two other studies, all concerning subsistence salmon harvests and practices, between 2011 and 2015 in the Chilkat River area (Table 1-1). While each project had its own objectives and methods, the subject matter of the KRIs in the two other studies overlapped with this project's objectives sufficiently to be analyzed and incorporated into this report. One of the three project objectives of the Chilkat Chinook Salmon Ethnography study was to "gather traditional ecological knowledge (TEK) about Chilkat Chinook salmon in the Chilkat River through household surveys, key respondent interviews, and participant observation." Similarly, one of the two objectives of the Northern Tlingit Salmon Ethnography project was to "document Tlingit traditional ecological knowledge of salmon."

In March 2013, ADF&G Division of Subsistence researchers Meredith Marchioni and Davin Holen traveled to Haines and held a community meeting that included discussion about the CSRI research. Marchioni traveled to Klukwan to present information about upcoming projects (Table 1-1) and obtain approval from the Chilkat Indian Village to conduct study activities in Klukwan. Marchioni shared the goals and objectives of the study, requested the advice of the council and support from council members, and answered any questions that arose. Additionally, Marchioni held broader community meetings that centered on discussions of all aspects of Chinook salmon, such as gear types used for harvests, run timing and strength, and local ecological knowledge of the stocks and local environment. These meetings also presented an opportunity for Marchioni to learn about local concerns regarding management and general subsistence practices. These issues informed the interview protocol used in the project.

In April 2012, the Chilkat Indian Village tribal council provided a letter of support for the Division of Subsistence to conduct research (see Appendix A). The Chilkat Indian Village was supportive of the projects taking place in Klukwan and provided assistance both initially and throughout the three years of fieldwork. The tribal council assisted in identifying individuals with whom participant observation and interviews could be conducted. Table 1-2 lists project personnel, including individuals involved in project management, field research, and report writing.

Key Respondent Interviews

Semi-structured, in-depth interviews were conducted with subsistence and commercial salmon harvesters and elders in the communities of Haines and Klukwan. While interviews are guided by a list of questions related to the research goals, this approach also allows the interviewer flexibility to branch into other topics if he or she feels the information is relevant to the study objectives based on his or her own experiences and knowledge (Bernard 2006:212). Appendix B presents the interview protocols used to guide the documentation of LTK from interview participants in Haines and Klukwan as part of the project objectives for the Chinook

6. Alaska Federation of Natives. "Alaska Federation of Natives Guidelines for Research." Alaska Native Knowledge Network, http://www.ankn.uaf.edu/IKS/afnguide.html (last modified August 15, 2006, accessed February 25, 2014).

Table 1-1.–List of research projects in the study area, 2011–2015.

Project name	Funding source	Principal Investigator	Study community	Fieldwork	Studied resources	Research methods
Northern Tlingit Salmon Ethnography	Alaska Sustainable Salmon Fund	Dr. Steve Langdon (UA) Dr. Meredith Marchioni (ADF&G)	Haines and Klukwan	2012	Salmon: Chilkat and Chilkoot rivers	KRIs
Chilkat Chinook Salmon Ethnography	Alaska Sustainable Salmon Fund	Dr. Meredith Marchioni (ADF&G)	Haines and Klukwan	Mar 2014–Mar 2015	Salmon	Harvest surveys, KRIs, participant observation
Chilkat Chinook Salmon Research Initiative	Legislature increment	Dr. Meredith Marchioni (ADF&G)	Haines and Klukwan	Mar 2014–Aug 2014	Chinook salmon	KRIs

Note "KRIs" indicated key respondent interviews.

Table 1-2.–Project staff.

Task	Staff	Organization
Principal Investigator	Meredith A. Marchioni	ADF&G Division of Subsistence
Regional Program Manager	Davin Holen	ADF&G Division of Subsistence
	Brian Davis	ADF&G Division of Subsistence
	Robin Dublin	ADF&G Division of Subsistence
Statewide Research	James A. Fall	ADF&G Division of Subsistence
	Caroline Brown	ADF&G Division of Subsistence
Data Management Lead	David Koster	ADF&G Division of Subsistence
Administrative support	Maegan Smith	ADF&G Division of Subsistence
Transcriptions	Dustin Murray	ADF&G Division of Subsistence
	Erica Mitchell	ADF&G Division of Subsistence
	Eric Schacht	ADF&G Division of Subsistence
	Lisa Hutchinson-Scarbrough	ADF&G Division of Subsistence
	Yoko Kugo	ADF&G Division of Subsistence
	Valerie Cates[a]	University of Alaska
Qualitative Data Analysis	James M. Van Lanen	ADF&G Division of Subsistence
Cartography	Margaret Cunningham	ADF&G Division of Subsistence
Editorial Review Lead	Mary Lamb	ADF&G Division of Subsistence
Field research staff	Meredith A. Marchioni	ADF&G Division of Subsistence
	James M. Van Lanen	ADF&G Division of Subsistence
	Eric Schacht	ADF&G Division of Subsistence
	Steve Langdon[a]	University of Alaska
Report Writing	James M. Van Lanen	ADF&G Division of Subsistence
	Lauren A. Sill	ADF&G Division of Subsistence

a. Staff member involved solely in research efforts for the project Northern Tlingit salmon ethnography.

Salmon Research Initiative. ADF&G Division of Subsistence researcher Meredith Marchioni, and Professor Steve Langdon from the University of Alaska, with additional assistance from ADF&G researcher James Van Lanen, conducted a combined total of 36 interviews with residents of Haines and Klukwan: 17 interviews with respondents who identified primarily as commercial fishermen; 18 with self-identified subsistence fishermen; and one interview with a respondent whose primary focus was sport fishing for Chinook salmon, but who had participated in local commercial fisheries. While respondents were categorized as subsistence, commercial, or sport, these designations did not preclude respondents having been active in other fisheries. For example, a respondent may consider himself or herself primarily a subsistence fisher but may have participated in a commercial fishery in the past and may engage in sport fishing for the purpose of procuring fish for home use. Interview topics did not constrain the respondents from discussing multiple types of fishing. Researchers conducted follow-up interviews with some respondents to further discuss observations that came up during the original interview.

Due to the small population of Klukwan (84 residents in 2014), the first interviews were conducted with fishers who approached Marchioni during her initial community presentation. In Haines, Marchioni had previously identified three high-harvesting subsistence households and three commercial gillnetters, which constituted the first interviews of each category of respondent. Additional respondents were identified during the course of the study using snowball sampling, a network sampling method for studying a population. In this method, one or two respondents who are part of the study population—in this study comprising individuals who were full-time residents of Haines or Klukwan, had held a subsistence permit or a commercial gillnetting permit, and had fished for no less than 10 consecutive years—are interviewed and then asked to recommend other people in the population to interview. According to this method, 10–20 knowledgeable people are typically enough to uncover and understand the core categories in a study of lived experience (Bernard 2006), although Morse (1994) recommends 30–50 interviews for ethnographic studies. All key respondent interviews in this study were semi-structured and open-ended, conducted either in households or public settings depending on the wishes of the interviewee, and lasted anywhere from 1–4 hours.

Interview respondents represented a range of age groups and fishing experience. Subsistence fisher respondents were aged 36 to 84 years old: five were female and 13 were male. All had been subsistence fishing for salmon, or processing salmon, in the Haines/Klukwan area for most of their lifetimes. Commercial fishing respondents were aged 32 to 60 years old: two were female and 15 were male. Collectively, commercial gillnetter respondents had spent less time over the course of their lives fishing for salmon in the region than had the subsistence fisher respondents, but most had been participating in commercial fishing in the region for at least 20 years. The single sport fisher respondent was a middle-aged male who had spent most of the past decade actively fishing for Chinook salmon in the region under sport fishing regulations. Because the interview data used in this report originated from three separate but related projects, not all interviews covered the same topics. All projects addressed salmon generally, and Chinook salmon specifically, and this report draws on those pertinent portions of all the interviews. Appendix B is the interview protocol for respondents engaged specifically for this CSRI project and show that among other topics, interviewees were asked questions about how local salmon runs have changed over time (run health, run timing, etc.), their participation history in commercial or subsistence fisheries, what they believe is affecting salmon runs, and what they believe should be done to preserve or rebuild local stocks. Questions were focused around Chinook salmon in the Chilkat River; however, information about other Chilkat salmon runs was also collected. Interviewees could respond to questions for as long as they wanted and their answers would often direct the researcher to his/her next question. If an interviewee permitted, the interviews were recorded and transcribed at a later date. All key respondents were given the option of whether their names could be used in a report; for this report, the authors have chosen to maintain anonymity of all respondents. Each respondent was assigned a code consisting of letters identifying whether the respondent was being interviewed primarily as a commercial (CF), subsistence (SUB), or sport fisher (SF) followed by a number.

Data Analysis and Review

Key Respondent Interview Analysis

All interviews were audio recorded and then transcribed, either verbatim or summarized, by Marchioni and ADF&G graduate interns Eric Schacht, Dustin Murray, Erica Mitchell, and Yoko Kugo, as well as ADF&G staff Lisa Hutchinson-Scarbrough and University of Alaska student Valerie Cates. Key respondent interview data were analyzed using inductive coding to identify all prominent themes linked to Chilkat River Chinook salmon (Bernard 2011). Resource observations, concerns, identified management problems, and suggested solutions were compared to published ADF&G Chilkat Chinook salmon management actions and studies.

Findings Review

This project launched under the leadership of former ADF&G researcher Marchioni, the project's Principal Investigator, who was provided with a draft of the findings for review after the report was compiled by ADF&G researchers James M. Van Lanen and Lauren A. Sill. Additionally, as noted previously and depicted in Table 1-1, this report uses KRI material collected as part of the Northern Tlingit Salmon Ethnography project headed by Professor Langdon; as such, Langdon was also provided an opportunity to review the use of transcribed interview material collected for that ethnography in a draft version of this report. The ADF&G Haines Area Management Biologist Rich Chapell was able to bring experience and knowledge about fisheries in Southeast Alaska to bear on the contents of the report during a review of the draft. The community of Klukwan was provided with a draft of the final report sent to the Chilkat Indian Village for review but no feedback was provided to ADF&G. The report was finalized after other feedback contributions were evaluated and incorporated. The content of this report is solely the responsibility of ADF&G Division of Subsistence co-authors and does not necessarily represent the views or knowledge of any of the reviewers.

Final Report Organization

Analysis of the qualitative data yielded the following themes, which are reported in the following chapter: importance of subsistence and commercial salmon fishing; use of commercially caught salmon retained for home use; local knowledge of Chinook salmon habitat, migration, abundance, and health; reasons for Chinook salmon declines; and perspectives on management solutions. Chapter 3 begins with a discussion of areas of alignment and apparent disagreement between managers, biologists, statisticians, and key respondent interviewees. The chapter concludes the report with a recap of the project and the role of Chilkat Chinook salmon and a list of recommendations to improve management of these fisheries.

2. THE ROLE OF LOCAL AND TRADITIONAL KNOWLEDGE OF SALMON IN HARVEST PRACTICES

The Importance of Salmon

All five species of Pacific salmon found in Alaska run up the Chilkat River. Accordingly, fishing is ingrained in the study communities. Many area residents, especially those residing in Klukwan, are principally subsistence salmon fishers with a long history of dependence on salmon. The importance of subsistence salmon fishing was adamantly expressed by all subsistence fisher respondents in this study. A primary example is provided by the following quote from a Klukwan resident who places subsistence fishing as a priority over participating in the monetary economy:

> It is our way of life … [during summer] you cannot even have a full-time job because you need to be sure that your freezer and your jars are full for the wintertime … we can buy groceries but it doesn't feed the [same] way as gathering the salmon … you are cutting the fish, you are cutting the fish with your grandmother. You're cutting your fish with your uncle, your thoughts are with your ancestors that have done it. The same basic way that you are doing, your process, so it is our way of life, and it is a whole way of life that could disappear if the salmon disappear. (SUB08)

Subsistence fishing is also important to Haines residents, many of whom are also active participants in the commercial fisheries. In 2014, 112 permit holders from Haines held 171 permits for any commercial fishery.[1] Multiple Klukwan residents have held commercial fishing permits in the past, but in 2014 there was one active commercial fishing permit holder. Subsistence fishers primarily fish for sockeye (red) and coho (silver) salmon in the river with set gillnets. Subsistence nets are also fished in the marine waters of Lynn Canal.[2] Chinook (king) salmon are not targeted by the majority of subsistence fishers, neither are chum (dog) and pink (humpy) salmon. However, if any of those three species are caught in the net and will not survive, then the fish will be kept. Commercial fisheries in the area target sockeye salmon, but Chinook salmon are harvested incidentally.

For fish caught non-commercially (under subsistence, sport, or personal use regulations), the majority of area residents depend primarily on sockeye salmon: according to findings of a household survey conducted for 2014, Klukwan residents harvested for home use an estimated 250 lb per capita of sockeye salmon, 36 lb per capita of coho salmon, 8 lb per capita of Chinook salmon, 4 lb per capita of chum salmon, and less than 1 lb per capita of pink salmon.[3] While all Klukwan households used salmon, about 63% of households engaged in fishing for salmon that year. In Haines in 2012, 30 lb per capita of sockeye salmon were harvested for home use, followed by 7 lb per capita of Chinook salmon, and less than 5 lb per capita of the remaining three salmon species (Sill and Koster 2017). Approximately 92% of Haines households used salmon in 2012, and 66% of households fished for salmon.

While not the primary fish sought by either subsistence or commercial fishers in the region, Chinook salmon have always played a significant role in the Haines/Klukwan fishing cultures. For Tlingit residents of both

1. Alaska Commercial Fisheries Entry Commission, "Permit & Fishing Activity by Year, State, Census Area, or City: State or Census Area: Haines Borough, City: Haines" https://www.cfec.state.ak.us/gpbycen/2014/100170.htm (accessed April 2020).
2. Haines salmon fishing location data for 2012 are published in Sill and Koster (2017:63–64); 2014 salmon fishing location data for Klukwan collected by ADF&G Division of Subsistence are not published.
3. David Koster, Research Analyst, ADF&G Division of Subsistence, "Chilkat Chinook Salmon Ethnography," unpublished data, 2014.

communities, the use of Chinook salmon extends back generations, likely since their ancestors settled along the coasts of Southeast Alaska thousands of years ago (Langdon 2013rev.). Chinook salmon are important to other residents as well. "Everybody loves king salmon. It's good for the economy, good for people, good for the freezer, and BBQ. We all love kings" (CF17).

The importance of salmon, and Chinook salmon, to the area can be seen in local place names: "*T'á*" in Tlingit translates[4] to Chinook salmon. The famous Taku Inlet and Taku River (Taakú), located near Juneau, may be named after Chinook salmon (Thornton 2012:68). Near Klukwan, the Takhin River, a prominent tributary of the Chilkat River, appears in proper Tlingit as "*T'á. héeni*." An elder respondent explained that this place name is a result of the river's association with Chinook salmon: "…we all pronounce *T'á. Héeni* as if it is one word, but it is two words. … '*T'á*' meaning 'king salmon' and '*héeni.*' meaning 'the water' that belongs to the king salmon" (SUB08). Another elder respondent said: "… before my dad's time, they go away up up into Takhin where they [Chinook salmon] spawn … and they harvest king salmon" (SUB02).

Salmon Use and the Development of Local Knowledge

One elder from Klukwan shared how the Tlingit learned about salmon lifecycles and habitat and passed that knowledge through the generations:

> [Our elders talked] about where the King Salmon People lived and where they spawned. That's how we start learning about that. Where did we learn it from? Did we learn it from biological books? We learned it from the salmon itself, the very same way scientists learn about salmon—they learned it from salmon. We learned it from salmon as well … the whole length of story about how when the salmon goes and it's spawning … it is little eggs in the stream, how all the different creatures, predators, prey on it: the sea birds, the king fishers, the trout, all of the different types of frogs [that] prey on the salmon … . And then when they turn into the little fingerlings, when they become a little fish after they come out of the eggs … . We learned all the biological process of the salmon from the Salmon People. Salmon told us. We even learn that salmon went out into the ocean, and there again, there were salmon sharks, there were sea lions, there were seals, there were whole varieties of other creatures that prey on them. And before the Department of Fish and Game, their study, we knew that a very small percentage of the salmon returns to this stream. We knew that from the Salmon Boy's story and we learned about all the different places how the king salmon, how the sockeye, how the dog salmon, how the coho, [also known as] silver salmon, how the pink salmon came into the different types of water that they like to be in … . From the Salmon People telling us their story, just like now I am telling you what I heard from my grandparents. This is the way I heard it in the smokehouse. (SUB01)

Local and traditional knowledge is a way of knowing based on an accumulation of observations. Berkes et al. (2000) define traditional ecological knowledge as "a cumulative body of knowledge, practice, and belief, evolving by adaptive processes and handed down through generations by cultural transmission, about the relationship of living beings (including humans) with one another and with their environment." Consequently, the fishers who identify primarily as commercial fishermen hold a different body of knowledge than those who identify primarily as subsistence users. The methods and locations these fishers use to pursue their fishing activities translate over time into distinct knowledge bases. Salmon that are born in the Chilkat River watershed migrate to the ocean where they spend some number of years, depending on the species, before returning to the fresh water to spawn. As the fish make their way back from the ocean, they encounter several fisheries as they approach the Chilkat River. Commercial drift gillnetters fish Lynn Canal, targeting four local stocks of sockeye salmon, including Chilkat River stocks. This commercial fishery also targets hatchery-produced chum salmon, and wild coho and chum salmon in the fall. Permit holders in this fishery are predominantly Southeast Alaska residents; of the two study communities, it is mainly Haines fishermen

4. Tlingit spellings and definitions throughout this report come from Twitchell (2016).

participating in the fishery. The marine subsistence fishery occurs in Chilkat Inlet, north of the latitude of Glacier Point. This is also a drift gillnet fishery, prosecuted mainly by Haines subsistence fishers targeting sockeye salmon. Sport fishers also ply the marine waters, especially for coho and Chinook salmon, but pink and chum salmon are also caught. Once they are in the river, salmon are subject to the inriver subsistence fisheries. These fisheries have the highest participation by Haines and Klukwan fishers who are targeting sockeye salmon, although other species are incidentally caught and kept.

Interviews during this study revealed in-depth local knowledge about two types of Chinook salmon behavior: knowledge of feeding Chinook salmon inhabiting saltwater areas, and knowledge of spawning Chinook salmon during their annual migration from salt water into freshwater river systems. The former set of knowledge was mostly provided by commercial fishery respondents and the latter set of knowledge was mostly provided by subsistence fisher respondents. Before exploring these topics further, a brief overview of Chilkat River Chinook salmon life history based on biological research that complements observations shared by key respondents is provided.

Radiotelemetry studies have shown that most Chinook salmon returning to the Chilkat River spawn in one of two tributaries: the Kelsall River or the Tahini River (Ericksen and Chapell 2006). Chilkat River Chinook salmon spend two winters in the freshwater environment before migrating to marine waters as smolt and then they spend 1–5 five years in marine waters before returning to the Chilkat River as mature fish (Ericksen and McPherson 2004). The spawning population of Chilkat River Chinook salmon is dominated by 4-, 5-, and 6-year old fish (Ericksen and McPherson 2004). As juveniles in the fresh water, Chinook salmon eat a variety of plankton and insects. Once in the ocean, they feed on smaller fish (e.g., Pacific herring, sand lance), squid, and crustaceans.

Seasonal Run Timing

Chinook salmon is the first species of salmon to arrive in the Chilkat River after the April–May eulachon run (most often referred to by local residents as "hooligan"). The presence of sticklebacks *Gasterosteidae aculeatus* (a small prey fish) is seen as an indicator for the coming arrival of the eulachon run, and thus the pending arrival of the Chinook salmon run. A Klukwan elder explained: "… to me king salmon seem to follow the hooligan run … [but] the pinfish [sticklebacks] … are the fish kinda come up … before the fish come. [They precede even hooligan, they will come] all the way up to the river" (SUB08).

Chinook salmon can be harvested as early as April when Tlingit residents traditionally focused on harvesting eulachon. Sometimes Chinook salmon were caught at this time and were a very welcome fish for fresh consumption:

> But then, you know, I remember my dad always talked about when they go down, harvest hooligans in April, they always took old women because they catch fresh king salmon. So they cook king salmon while they are down in the camp down there first making hooligan oil … while fish in there … we just eat it. Not that many. (SUB02)

While the elder respondent quoted above reported Chinook salmon being present as early as April, most respondents reported that the first Chinook salmon normally arrive in the Chilkat River drainage during May. By June 1, Chinook salmon are running strong and are then present in the river system throughout the summer season. A Tlingit elder from Klukwan explained that, traditionally, after enough fresh sockeye salmon were caught, July to August was the time when local residents began expending a concentrated effort on catching Chinook salmon, traveling further upriver to seek them out closer to their spawning grounds, "… July, August, when king salmon are up in that place [upper tributaries of the Chilkat River drainage], they [the Tlingit] head up that way, and gathered [Chinook salmon]" (SUB02).

Harvest Locations

Commercial and subsistence harvesters shared their knowledge about where salmon can be found and harvested. Respondents who spoke of salmon in the marine environment focused on the factors of salmon behavior and environmental influences, such as the wind, water temperature, or sunlight. Respondents who

discussed harvest locations in the freshwater system focused more on how the landscape influences where the salmon are found.

Marine Waters

Commercial gillnetter respondents explained that the location of food resources is what most determines the location of schools of saltwater-inhabiting feeder Chinook salmon. While there are specific locations that commercial fishermen can expect to encounter Chinook salmon in salt water, respondents explained that these locations shift annually based on available food resources. Other factors that influence where commercial gillnetters encounter Chinook salmon are the depth of their nets, weather patterns, and the time of day that fishing occurs. A commercial gillnetter respondent explained that Chinook salmon behavior is unique when compared to other species of salmon: "Kings are a different fish. You can't compare them to any of the other ones because of the depth that they swim at and where they feed, what they eat on … they're totally outside of all the other fish when it comes to that point" (CF05). Several respondents observed that Chinook salmon have a preference for deeper water, which is related to water temperatures, weather, and tides. Respondents reported that on calm, sunny days when the surface waters warm, Chinook salmon will stay deep; when the water becomes colder as a result of less stable weather, then Chinook salmon will more frequently inhabit relatively shallower depths. Respondents explained that while Chinook salmon especially prefer deeper and colder waters, all species of salmon change locations based on water temperatures and weather conditions. The following comments—note each comment comes from a different commercial gillnetter—illustrate the observations of commercial fishermen in this regard:

> It seems like most fish do come up at night … during a hot, really calm day, they'll all be deep. … Different weather conditions, they'll come on up. If it's raining it seems they're on the top a lot more … because it's murkier so they're more … camouflaged. (CF16)

> The weather is a huge factor … fog being on the water and it is colder on the surface, or darker. … Cloudy, rainy days are usually better fishing than bright sunny. (CF11)

> When it's clear, calm, and hot [salmon] run deep. These are bad fishing days. When [the wind] blows it brings them up, and when it's cloudy. (CF17)

> It depends mostly on the weather. If we have bad weather, [salmon] will be at the bottom of the net. If you have good weather where it's blowing a little bit [salmon] will be up at the top. (CF04)

> Cloudy days you'll catch fish on the surface a lot more than you will on bright sunny days … they go down … the sunlight is the biggest thing that drives them deep … if it's sunny weather, it drives them deep, if it's cloudy weather they'll be right up on top, [on] rainy cloudy dark days. (CF08)

Commercial fishing respondents discussed specific geographic areas where Chinook salmon are more susceptible to being caught in salt water. For example, Mud Bay and the area around the Katzehin River mouth were reported as consistent areas for encountering feeder Chinook salmon. Commercial gillnetter respondents believed that most of the feeder Chinook salmon they catch are not Chilkat River Chinook salmon but are instead Chinook salmon that will eventually return to other river systems, such as the Stikine River or places further south. Some respondents said that Chilkat River Chinook salmon inhabit only waters of the Inside Passage during their entire lives, thus rendering them susceptible to being caught by any commercial fisheries in these sheltered waters of the passage.

Once Chinook salmon start moving into the rivers to spawn, they are caught by subsistence fishers in salt waters near the river mouth. According to some subsistence fishers, while targeting early sockeye salmon runs, Chinook salmon are caught incidentally in saltwater subsistence setnets at locations in Chilkat Inlet such as Pyramid Harbor, Letnikof Cove, Paradise Cove, Mab Island, Seduction Point, and Glacier Point.

Fresh Water

The majority of contemporary subsistence fishers interviewed for this project have fished for salmon in the same areas for all of their lives in the region, and some as part of families that have used these same areas for many generations. Respondents describe the Chilkat River during the May–July Chinook salmon run as mostly a silty, muddy river without much clear water. However, the various tributaries where Chinook salmon spawn—such as the Klehini River, Takhin River, Little Boulder Creek, and Big Boulder Creek—are clearwater channels and the mouths of these tributaries are known locations for encountering Chinook salmon. "There is a place [where the Klehini River comes out into Chilkat] … that is a good spot for king salmon" (SUB06).

For spawning, Chinook salmon desire clear water. "… the water where the salmon spawned, I remember when we were right up [in] those areas and the water was so clear. You could see all the way to the bottom," said a Klukwan elder (SUB01). When discussing salmon spawning habitat, Tlingit respondents referred to "ís*h*," or "ísh-kaa-héeni," explained by a respondent to mean "a water system within a water system" (SUB01). The word generally describes a deep hole or pool of slower moving water in a freshwater stream where salmon congregate, but the concept of ís*h* derives from generations of Tlingit observations of salmon behavior, stream morphology, and preferred in-stream habitat (Langdon 2006). A Klukwan elder explained:

> Ísh-kaa-héeni [are places where] you gonna find pureness of the water, you gonna be able to see the bottom of the [river]. A lot of the time there is very little silt, which is completely, you might see salmon on the rocks and things that are, that are not salmon but rocky, little rocks, and the area—almost like when you are looking like in an aquarium. (SUB01)

The elder continued:

> [A spawning area] is a place where they are going to multiply themselves, that they go to. They know where to go to be able to really, to really successfully multiply. … Usually, those spawning areas are close to place[s] where the natural, natural process of the oxygenation of the water that technically they need that, they need that really [clean] water, very super important. The way the water is flowing and the way it kept cleaning, the way it sustains itself. … It's really, really referring to the amount of little babies coming out in one area. … [The elders] would say, "In the Chilkat River, the Chilkat tributary places [the salmon] … go to different areas for the process of reproducing." Like king salmon, … they like certain areas, same way with sockeyes, same way with humpies [pink salmon] and cohos and dog salmon. (SUB01)

Tlingit respondents said that ísh does not always mean spawning locations; it also implies both slow or almost still water, in terms of velocity and depth. It can be a resting place for salmon to recover and regain strength but not necessarily a spawning place. The elder continued:

> [The elders] fished where the ísh-kaa-héeni is. The word, ísh-kaa-héeni, means, a water system within a water system. That river out there is a water system. But within that water system there are different places where the salmons are spawning, where there is ísh-kaa-héeni coming out. They need oxygen. They really need oxygen, they need cleanliness, real cleanliness. (SUB01)

Several traditional Chinook salmon subsistence fishing locations along the Chilkat River, Klehini River, and their tributaries are considered ísh-kaa-héeni. Following the route of the Haines Highway as it travels through the Chilkat and Klehini river valleys, important traditional Chinook salmon fishing locations occur from approximately the Tahkin River mouth, which is adjacent to Mile 9 of the Haines Highway, and extend to the junction of Big Boulder Creek and the Klehini River at Mile 33. The Haines Highway travels along the eastern side of both the Chilkat and Klehini rivers and, as discussed more in the following section, within this corridor Chinook salmon are known to run mostly on the eastern side because the water there tends to be deeper. The eastern shore of the Chilkat River near Mile 15 is the site of a traditional Tlingit

Chinook salmon fishing camp: "… we used to fish 15 Mile just, just for king salmon. My dad showed us where. King salmon, that's all we caught is king salmon. Nothing else." said a Klukwan elder (SUB03). The community of Klukwan, located at Mile 21.5 of the Haines Highway, originated first as a traditional Tlingit salmon fishing camp and, as discussed above, is another known Chinook salmon harvesting location (largely on the river's eastern side).

The Tsirku River alluvial fan, adjacent to Klukwan, acts as a large water reservoir, preventing the Chilkat River from freezing except during long cold spells in mid-winter. "It could be, it could be 10 or 15, or 20 below zero … it [the water] won't be frozen" (SUB01). This hydrologic anomaly is considered to have the properties of an ísh. This area has been designated as the Chilkat River Critical Habitat Area and the Alaska Chilkat Bald Eagle Preserve, in part because of the concentration of salmon and the effect it has on bald eagles. A Klukwan resident explained: "That [where the eagle preserve is now] is a king salmon spot … they stop to rest in that slough down here. In fact, that is where I go fishing when I want a king salmon. They still go in there and that is where they rest" (SUB05).

Other important spawning grounds—and thus traditional Chinook salmon harvesting locations—reported by Tlingit respondents during this study include Little Boulder Creek, Big Boulder Creek, the Klehini River, the Tsirku River, Sheep Canyon Lake, and the Tahini River (often referred to by local residents as "King Salmon River") (Figure 2-1). "We used to go a ways up. Oh, lots of place up there, called Sheep Canyon Lake and there was a good [place] through there. We fish there and we got king salmon. They [kings] were headed up, headed up farther," reported a Klukwan elder (SUB16). "We got a place up there called King Salmon River, up past the Turtle Rock … there is king salmon go up in there and go up a little creek, go up there. You see them jumping up, all the way up. Big, big king salmon" (SUB16). The same elder recalled that up until residents obtained motor skiffs (late 1940s), Tlingit fishers would travel up the Chilkat River and its tributaries by canoe to establish fish camps to fish for Chinook salmon:

> But back in old days, they used to use canoes, paddles, oars. … There was no other way. I don't think anybody knew anything about skiff until probably back in the '40s. … Probably, [bring back] 10–15 king salmon … there were the places far [up] too [that you could fish], … I forget the names of those places. … Depend on what we were catching on. [If] we were catching anything that place we stay there. But [if we] were not catching anything we move to the next spot. (SUB16)

Most subsistence salmon fishing today occurs from Klukwan to Mile 23 of the Haines Highway where the Wells Bridge crosses the Chilkat River at its junction with the Klehini River (Figure 2-1). This area provides the most suitable locations for placing set gillnets. Respondents reported that subsistence Chinook salmon fishing was traditionally pursued further up the Chilkat River past its junction with the Klehini River, at locations such as the Kelsall River and the mouth of Nataga Creek, and that most fishing locations extended further up the Klehini River, especially during the time when residents were legally allowed to harvest Chinook salmon by gaff. Respondents mentioned that the area between miles 26 and 27 was a traditional Chinook salmon gaffing location on the Klehini River, but that Mile 33—where Big Boulder Creek drains into the Klehini River—was the most popular location. One respondent related that while his family did not go to Big Boulder to gaff fish, they used to go up to watch Chinook salmon because there were so many up there (SUB10). And another respondent recalled going up to Big Boulder in the latter part of July or the beginning of August and that it was the only place anybody ever went for catching Chinook salmon; he continued, saying that the Chinook salmon at Big Boulder were "humongous" compared to Chinook salmon today (SUB12). The Tsirku River, Chilkat Lake, and Bear Creek were also reported as traditional Chinook salmon gaffing locations.

Subsistence fishing respondents also differentiated between "red" and "white" Chinook salmon[5], which run simultaneously up the Chilkat River and into the various tributaries. A subsistence fisher respondent

5. Chinook salmon with red flesh and white flesh are the same species of fish. The difference in the color of flesh comes from a genetically determined ability to metabolize carotenoids found in their prey. For more discussion of red and white kings, see Thompson (2015).

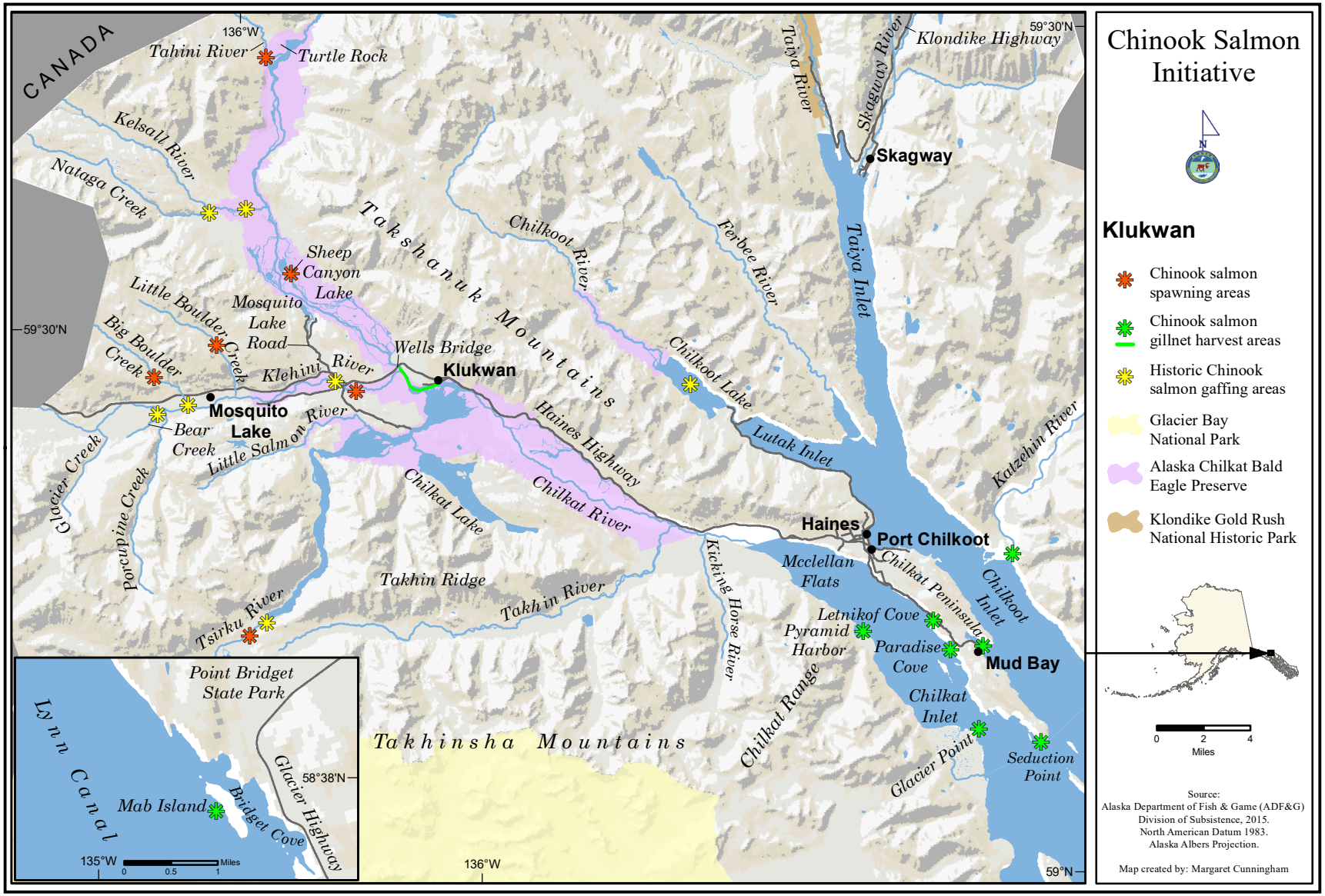


Figure 2-1.–General areas mentioned by respondents during interviews that were associated with Chinook salmon.

explained: "They go together, the red and white [king salmon]. They don't go separate places" (SUB07). For many subsistence users, "white" Chinook salmon are considered both abundant and better-tasting than "red" Chinook salmon. For example, a subsistence fisher respondent said: "I would rather eat white king than red king. It is tastier, oilier. We get a lot of them up here [Klukwan]. In fact, I don't see many red king. I don't mind catching the kings, if I want one I go down to the slough to get them. … I love making dry fish out of them [white kings]" (SUB05).

Harvest Techniques

The ability to harvest salmon is a particular skill, developed over time through trial and error, observation, and sharing of information with others. Salmon behave differently when they are in the open ocean compared to when they are in the rivers heading toward their spawning grounds and fishers in each environment learn these behaviors and understand how to catch, or how to avoid, the fish. Both sets of knowledge holders discussed where in the water column one is likely to encounter Chinook salmon, but observations of the marine environment included salmon feeding behaviors, whereas in the freshwater systems, salmon are no longer feeding and the observations tended toward observations of water currents.

Marine Waters

Two main behaviors of Chinook salmon influence how commercial gillnetters harvest them. Commercial gillnetters reported that, compared to other salmon species, Chinook salmon tend to inhabit deeper water. When Chinook salmon are caught in commercial nets during the daytime it is often at the deeper portions of the net. For example, a respondent said that when harvesting salmon with a gillnet, "sockeyes are up top, dogs … could be anywhere from top to bottom, kings we usually catch about mid-net, about 15 feet or so" (CF08). Secondly, respondents reported that because Chinook salmon concentrate on feeding at night, it is most common to harvest feeder Chinook salmon during night hours rather than during the daytime. "Fish at night and you're going to get feeders. Typically, if you're fishing in the fall and … you need some sleep, so you make a two-and-a-half-hour set through the middle [of the night], you'll probably [catch] 18–25 kings," explained one respondent (CF09). Respondents suggested that salmon follow smaller fish that come up toward the surface of the water to feed upon them. Respondents reported that sometimes commercial fisheries have been subject to nighttime closures specifically for the purposes of protecting these juvenile Chinook salmon. ADF&G has previously researched Chinook salmon catches based on time of day (Ericksen and Marshall 1997); also, in 2017, following this project's study period, ADF&G implemented commercial drift gillnet closures at night in Southeast Alaska.[6]

Fresh Water

Some subsistence fishers commented that spawning Chinook salmon prefer to travel and rest in the deepest parts of the river. A primary theme from the interviews was that subsistence fishers who target sockeye salmon inriver overwhelmingly place their nets on the west side of the river, which has shallower water that sockeye salmon prefer to travel in, rather than set their nets in the deeper water on the east side of the river where Chinook salmon prefer to travel. For example, a Klukwan elder said:

> … most of the people, village, fishes on the far [west] side. Could be the village kings hardly ever laid on that side, it is always on, you know this [east] side of the river, it's deeper. The sockeye want that [west] side, so you don't catch any [king salmon] on that side. … kings usually run up to the deep side, right here in the bank. (SUB02)

Respondents explained that shallower water creates a faster river current and that Chinook salmon prefer the slower and more relaxing current of deeper water. Set gillnet locations are chosen in relation to back eddies. Back eddies are circular currents where water flows past an obstacle in a river. The Tlingit found that salmon rest in the back eddies on their way upstream, so it is a good location to fish. Nets are set in these

6. Alaska Department of Fish and Game. 2017. "News Release: Southeast Alaska Drift Gillnet Fishery Announcement." http://www.adfg.alaska.gov/static/applications/dcfnewsrelease/790195461.pdf (accessed April 2020).

back eddies. A subsistence fisher respondent said: "[My uncle told me] to fish in the back eddy. … Fish are going to pull in here because this is how it is easier to swim. And upriver if they go in a back eddy you push them up river instead of trying to swim against the current" (SUB05).

Fishing for salmon in the Chilkat and Chilkoot rivers traditionally involved different techniques depending on the location and targeted salmon species. Basket traps and, beginning around the 1930s, gillnets were used. Chinook salmon were primarily harvested with gaffs and occasionally with spears. Gaff hooks, made of wood, bone, or antler (eventually replaced by iron), were attached to a wooden pole 10 ft–15 ft long (Mills 1982). The fisher, standing on shore or in a canoe would draw the gaff along the bottom of the river and quickly jerk the hook upward when a fish was felt or seen near the hook. Using a gaff allows fishers to selectively harvest fish based on the size, sex, and quality of the fish. Multiple respondents emotionally recalled fishing with gaffs for Chinook salmon when they were children at Little Boulder and Big Boulder creeks. One Klukwan resident recalled spending the whole day gaffing at Big Boulder Creek (CF01). A gaff has not been a permitted gear type on the Haines area subsistence salmon permit since the mid-1970s. During the time of the study, several Klukwan residents told researcher Marchioni that they would appreciate the ability to gaff Chinook salmon again and instruct their children and grandchildren in this selective fishing practice.

Rather than gaffs, most Klukwan residents now fish with set gillnets; occasionally drift gillnets are also used. Setnets are generally placed along the shore near the community. Fishers watch their nets while they are in the water (as required by 5 AAC 01.730) and check them several times a day, physically removing any fish that are caught.

Gillnets are set at the beginning of the subsistence fishing season by each fisher in their desired location. The river changes significantly every year, so it is difficult to ascertain who used what spot the previous year. Therefore, while a general area may be chosen based on previous years, the majority of fishing spots are annually claimed by whomever chooses a spot first. Gillnets are fewer than 50 ft in length (by regulation) and have both a lead line and a cork line. Setnets are attached by rope on one end to a metal pole driven into solid ground on the riverbank (generally about 2 ft down) and on the other end the lead line is attached to an anchor (often a metal car part recovered from the river). The anchor is necessary because of the Chilkat River's fast-moving current. Nets are set at a 90-degree angle to the shoreline. Based on how productive a fishing spot is and how the river and its tributaries change course throughout a fishing season, fishers will move their nets to maintain a good fishing spot. If a fisher chooses to target Chinook salmon, the net must be moved to a different part of the river; a fisher may do this for an hour or two to harvest a Chinook salmon for an elder before moving the net back to the main area used for sockeye salmon fishing.

In the past, Klukwan residents used drift gillnets more frequently than they do today. The Chilkat River has a strong current, requiring fishers to have a greater amount of skill to successfully fish with drift gillnets. In addition, the features of the river are constantly changing, with new features arising and old ones eroding. Despite the challenges, some fishers prefer to use drift gillnets because they can be deployed and retrieved in less time than a set gillnet and because the fisher can release undesirable fish quickly.

Importantly, for both conservation concerns and their own traditional practices of salmon harvest selectivity, traditional subsistence fishers dislike gillnet fishing for Chinook salmon; in contrast, the selectivity enabled by the gaff method is desirable. Subsistence fishing respondents reported during this study that fishing with a gillnet does not allow them to fish selectively and therefore they risk injuring a Chinook female and throwing her back in the river—a very undesirable practice. For this reason, contemporary Klukwan fishers report that they intentionally fish in areas of the river known to have sockeye and not Chinook salmon to avoid catching Chinook salmon in the net. If a Chinook salmon is caught in the net and will not survive it is kept and given to an elder. If an elder requests a Chinook salmon, a fisher will move his or her net to a spot where incidental harvest of Chinook salmon is more likely and will harvest a fish to bring to the elder; however, according to Klukwan residents, this is a significantly troublesome practice. As will be discussed in detail in the next chapter, many respondents expressed concern that subsistence gillnet fishing is having a largely negative effect on the Chilkat River Chinook salmon run.

3. LOCAL AND TRADITIONAL KNOWLEDGE OF SALMON LIFE HISTORY AND ENVIRONMENTAL CHANGE

Chilkat River Chinook Salmon Health and Abundance

Study respondents described noteworthy changes in the Chilkat River Chinook salmon population over recent decades. A large-scale decline in Chinook salmon abundance was the primary change reported by study respondents from each of the interview groups. Respondents reported that Chinook salmon were abundant in the Chilkat River during past decades, particularly the 1950s, 1960s, 1970s, and 1980s. "We never got skunked up. Now you, you're lucky to get a king salmon" (SUB03). A commercial gillnetter respondent said:

> I grew up in Klukwan. That's where I spent all my time, so I know where fish should be that aren't there anymore. When we were kids, we would run around on the flats all the time and we would see all kinds of spawning king salmon. (CF04)

Another commercial gillnetter respondent said: "[During] the early '70s we caught king salmon all day long. And every one of them was 30 pounds" (CF09). Another commercial gillnetter respondent said: "I can look at my fish report and know that, to be certain, I catch fewer king salmon now than I have in all my years" (CF03). Likewise, another commercial gillnetter said:

> The first and second [commercial] openings I would always come home with eight to 10 nice big king salmon [for home pack]. Last year I was lucky to get two or three … [there] used to be more. (CF15)

While no respondents in this study were commercial trollers, some gillnetters indicated that while trollers have traditionally relied on Chinook salmon for a substantial portion of their income during winter, today they must rely almost entirely on coho salmon for their commercial harvests. Respondents reported that Chinook salmon declines were noticeable as early as the 1990s, but that starting in the mid-2000s the decline became increasingly apparent—although Chinook salmon abundance was noted to have fluctuated some within this time period, with some years being more abundant than others. An improved abundance of Chilkat River Chinook salmon during the year before the interviews occurred was commented on by both commercial and subsistence fishers during interviews.

Alongside the reported overall decline in Chinook salmon abundance, study respondents reported that the average size and weight of Chilkat River Chinook salmon has also drastically declined. Respondents reported that the weight of Chilkat River Chinook salmon in the past averaged approximately 30–35 lb round (live) weight, but that during the last 10 years the average weight has been approximately 15–20 lb. Respondents reported that in the past it was common to harvest 40–60 lb Chilkat River Chinook salmon, and each year some 70–80 lb Chinook salmon were also caught. However, encountering Chilkat River Chinook salmon of these weights is rare and improbable today. One respondent commented that Chinook salmon are just smaller today and recounted catching salmon heavier than 80 lb when he was younger (CF01). During this project, the respondent expressed that it feels lucky to get a salmon weighing 25 lb. Another commercial fishing respondent said:

> [Chinook salmon] are a lot softer than they used to be [and] they don't hit the net as hard. They used to hit and a bunch of corks would go down. Now they just look like a bunch of other fish. You don't even realize it's a king salmon until it comes over [the hull]. (CF04)

One means by which local fishers gauge the average size of Chinook salmon is by monitoring the sport fishing catches from the annual Haines King Salmon Derby.[1] "They are definitely getting smaller. Just from the size of the derby winner … there have been a lot of 30-pound winners in the last few years. Barely 40 [pounds] last year" (CF15). The decline in size has been noticed elsewhere in Southeast Alaska as well. A sport angler respondent said:

> [Average Chinook salmon size caught in the Ketchikan King Salmon Derby has] gotten smaller over the last 50 years. It is consistently smaller. There are some big fish in there, but the fish have gone from like 60 pounds down to like 35. I think that happens to any fishery that is in decline; the fish are usually smaller, and the genetics are changing. There is less of a gene pool it seems like. (SF01)

A commercial gillnetter respondent suggested that one cause of the size and weight decline is that Chilkat River Chinook salmon are not living in the ocean as long as they did previously and not growing into full maturity before spawning: "They're returning at three years instead of five, [I] don't really know why [but] if there are younger fish returning, of course they're going to be smaller" (CF06).

While all study respondents agreed that the average size and weight of Chilkat River Chinook salmon have declined, some respondents reported that it has also always been normal for an abundance of smaller-sized Chinook salmon to return into the Chilkat River to spawn. Additionally, some respondents reported a long-term observation that the average size and weight of returning Chilkat River Chinook salmon fluctuates annually, with some years producing larger fish than other years. A commercial fishing respondent said:

> It varies from year to year … I feel like [Chinook salmon] cycle through the small size years and the big size years … and it seems like they're reasonably represented. You know some years they have big fish, some years they have small fish. (CF03)

Observed Environmental and Habitat Changes Affecting Chilkat River Chinook Salmon

Study respondents have observed changes in Chilkat River Chinook salmon habitat over recent decades. Observations concerned both saltwater and freshwater riverine habitats. Local knowledge of changes in saltwater habitat will first be described, followed by descriptions of changes in freshwater riverine habitat.

Observations of Environmental Changes in Saltwater Habitat

Study respondents reported observed changes in the ocean waters that they suggested could be possible causes of the Chilkat River Chinook salmon run decline. These changes include warming water temperatures in Lynn Canal; possible ocean acidification; decreasing food resources, such as forage fish, copepods, and crab larvae; and increasing amounts of predators, such as sea lions and whales (humpback and killer/orca). Several commercial fishing respondents discussed changing ocean conditions that might be affecting saltwater resources important to Chinook salmon food availability; each of the following statements from different commercial gillnetters are representative of observations:

> [Chinook salmon] don't seem to be having good survivability out in the ocean. They are getting out there, but they are not coming back. The ocean is a big place

1. The Haines King Salmon Derby has been an annual event since the late 1970s and normally occurs over two weekends in late May. There is no official record of past winners of the derby. The derby was canceled for several years during the 1990s, in 2008, and since 2014 to help conserve Chinook salmon stocks; see online articles about the closures:
   Margaret Friedenauer, "Haines King Salmon Derby Cancelled; Low Run Forecasted," *KHNS FM*, February 20, 2015, https://khns.org/haines-king-salmon-derby-cancelled-low-run-forecasted (accessed April 2020); and
   Henry Leasia, "Gillnetters' Barbecue Replaces Kings with Sockeye, Adds Event for Fishermen and their Families," *KHNS FM*, June 11, 2018 https://khns.org/gillnetters-barbecue-replaces-kings-with-sockeye-adds-event-for-fishermen-and-their-families (accessed April 2020).

> so I don't know if they will be able to figure that one out. But with ocean conditions changing … it might be a breakdown in what they feed on. (CF12)
>
> It's all about the different larvae and growth stages of those salmon and what they eat, when and where they go through those growth stages. (CF13)
>
> Years before [2014, while boating] you'd run over piles of feed one-quarter mile long, or one-eighth of a mile long, and 20 or 30 fathoms deep, and just drag through it all. Now you don't see anything at all out there. There's nothing. Just tiny, maybe a tiny spot here and there, and that's it. The feed and the [Chinook] salmon disappeared about the same time, about 5, 6, 7, 8 years ago. It just started dropping off big time. (CF08)
>
> It could be the ocean [that is causing the Chinook salmon decline in the Chilkat River]. It could be global warming. It could be acidification of the ocean and it is breaking down the food chain—the little copepods have the little shell and you get the acid in the water and they could be melting and they just don't ever grow. (CF12)

Local knowledge holders associated much about the above-discussed changes with ongoing climate change. A commercial gillnetter respondent reported that he sees the water getting much warmer than it used to be and he believes the fish are moving deeper to where it is cooler (CF01). Coupled with warming is concern for ocean acidification. "Yeah, if the ocean really continues to acidify are the salmon going to keep coming back?" asked a subsistence fisher respondent (SUB18).

While food resources in the marine environment were believed by study respondents to be increasingly affected by climate change, some respondents also suggested that the commercial crabbing industry has negatively affected the crab larvae populations that juvenile Chinook salmon rely on. For example, a commercial gillnetter respondent said:

> A big part of [the Chinook salmon] diet appears to be crab larvae. I think that there is a valid link to that because we've seen king and Tanner crab populations kind of cycle up here [in] correspondence with our salmon populations … I'm pretty sure that is because of the [commercial] pressure on our king and Tanner crab populations ... it's more than just coincidental that we've got a fairly depressed population of king and Tanner crabs [and,] at the same time, we have this happening with our king salmon. There are too many links that say that there is something going on there. (CF13)

More so than conditions in the ocean, however, are in-person observations of change in the Chilkat River system that local residents connect most directly to the Chilkat River Chinook salmon decline.

Observations of Environmental Changes in Freshwater Riverine Habitat

Study respondents provided notable information about environmental change in the Chilkat River watershed; their local knowledge identifies normal and expected facets of naturally occurring change in the riverine ecosystem, as well as identifies anthropogenic sources of change. Anthropogenic sources of change include abnormally increasing silt in the river due to increased glacial melt; unnatural river alterations resulting from highway construction, bridgebuilding, mining, and logging; and recreational effects. Subsistence fisher, commercial gillnetter, and sport angler respondents generally attribute the decline in the Chilkat River Chinook salmon population to an amalgamation of observed anthropogenic changes. Natural changes will first be discussed, followed by discussions of factors related to a shifting climate. Effects related to both development and recreation will then be discussed.

Local Knowledge of Natural and Expected Change in the Chilkat River Watershed

In response to inquiries about changes observed in the Chilkat River system, subsistence respondents first said that the currents, channels, and locations of back eddies, as well as places considered ísh, are always

changing naturally from year to year. Subsistence fishers have made a long-running practice of adapting to these expected natural changes. A subsistence fisher said:

> The river changes a lot, so if the river is high it [fishing] is good in one spot, if it is low it is good in another spot. It is always fluctuating. The river is always changing … the level of the water changes with the weather. You know, you get a hot day and more snow melts, and it brings the level up and if it is cloudy and cold the water level will drop. If it is rainy a lot the water will rise. It has always been like that. (SUB09)

"It's a very dynamic river," said a commercial gillnetter respondent (CF06).

Because the Chilkat River is glacially sourced it is generally a muddy and silty river, especially during the summer months when most of the salmon run up it. However, during fall when air temperatures decline the level of silt in the river also declines, and the Chilkat River becomes more of a clearwater river. A sport angler respondent explained, "I don't fish in the river until October [for coho salmon]. That is when it clears up for sport fishing" (SF01).

Local Knowledge of Climate-Driven Change in the Chilkat River Watershed

Notwithstanding the shifting conditions of the Chilkat River that are considered natural, subsistence fisher, commercial gillnetter, and sport angler respondents attributed part of the decline in the Chilkat River Chinook salmon population to new types of changes observed. Much of this change centers around abnormally increasing silt in the river, erosion, and flooding.

"The Chilkat River is not as deep as 100 years ago," reported a Klukwan elder in his 80s (SUB04). Another subsistence fisher commented that the river did not seem to change as much when he was young as it does now. He continued to discuss unusual increasing levels of silt in the river where it used to be deep, and how they have difficulty making it as far up the river with outboards anymore because it gets too shallow (SUB12). Another subsistence fisher concurred, saying that the river has changed dramatically over the last 40 years with the main river now having a lot of silt built up, leading to salmon habitat being washed out (SUB06). A sport angler from Haines said:

> … the pools where the small fish would have a place to go to are silting up. Supposedly, that is due to less log jams, and that is what is causing scouring in some pools in the rivers. Supposedly, there are less pools now. (SF01)

Increased siltation was reported to have occurred primarily due to erosion and increased glacial melt. "A lot of erosion coming down, the river has become shallower and more spread out … today there is probably six feet of new rocks and sediment" (SUB04). "The tributaries have changed … getting bigger and bigger," reported another subsistence fisher, who said the largest changes have occurred during the last 10 years (SUB17). Both natural landslides and the effects of past logging were reported as causes of erosion and siltation.

Study respondents reported that the Chilkat River used to be narrower and also that its banks have now become higher. "You know the banks of the river from when I was a kid are huge now. They're eight- to nine-foot banks … there's less and less habitat because the banks are so high" (CF16). Respondents reported that erosion has driven the Chilkat River system to become less resilient to flooding, especially flooding that results from high rainfall and rapid glacial runoff events. While in some places the riverbanks are higher, increasing sedimentation has also meant that flooding events more easily wash out riverbanks.

Several study respondents assigned a significant degree of responsibility for the increasing sedimentation and erosion to their observations of climate change occurring throughout approximately the last 20 years. Respondents said that warmer weather causing rapid spring snowmelt and increasing glacier melt is enhanced by an increasing occurrence of heavy rainfall events; combined, these conditions have led to increasing erosion and siltation. Local knowledge holders view this series of drivers as causing severe negative effects to Chinook salmon spawning beds in the Chilkat River system.

> There have been pretty hot summers [creating] a lot of flow from the glacial rivers flowing out. It seems like it is muddier or siltier … . Pools are silting up. And that is more of a change due to climate or just the rebound of the river. There are just less pools. (SF01)

A commercial gillnetter shared that the traditional Chinook salmon spawning grounds are changed now, in part because spawning places would get wiped out when the river got too high (CF01).

Respondents observed that climate warming has increased the occurrence of floods and dramatically shifted high- and low-water levels in the Chilkat River system. A subsistence fisher discussed a flood that occurred during 2014:

> This was a terrible flood this year [2014]. I never in my life saw the river get that high … we had a lot of snow in the spring and then we had a hot spell, so I knew it was going to flood. I didn't expect it was going to hit 100[°F] either, so it all melted. I am glad it didn't rain, or we would have really been flooded out. (SUB05)

A commercial gillnetter reported that the occurrence of abnormally high water resulting from major flooding events has become much more frequent and said that this could be severely affecting Chinook salmon:

> One of the biggest things that's messed with our fisheries is that we're having a rare event occur much more commonly than it used to: a 50-year flood that happens every 15 years now. It doesn't happen every 50 years like it used to, and that changes the system, the hydrology system. [When it floods, salmon] have less time to settle out and the fish have less time to establish spawning habitat before they get blown out … that's a big factor. When we're looking at our systems environmentally, things are changing pretty quickly and not necessarily in the same stable state that it was in 200 years ago … you have spawning channels that maybe stayed exactly the same for 50 or 100 years before big hydrology events, big blowouts and stuff. Whereas now maybe that might be happening every 15 or 20 years, and that has a huge impact [on spawning habitat], not to mention the impact that it has on rearing habitat. (CF09)

While increased flooding was reported to be a major driver of change in the Chilkat River system, it was observed to be sporadic and based on large rain events and heat spells that respondents indicated were occurring at unprecedented degrees. Contrasting local knowledge of flooding events exists for the opposite extreme: consistently lower overall precipitation during winter causing low water flows.

> Last year we didn't have that much snow and our rivers stayed low for a while. It took a while for fish to move up. Last year [2013] it hardly snowed, all year. That's when we had all the dead fish. They couldn't get to the river [because it was so low]. (SUB17)

A commercial gillnetter respondent said:

> When I was a kid there was just tons of snow here, I mean we'd have seven feet of snow in the backyard and it would never go away. Back then there was way more snow, in the early '70s it seemed like there was just piles of it. (CF16)

Respondents viewed the above-reported abnormal hydrological events as resulting from climate change, and as inconsistent and unpredictable; but, nonetheless, that an overall change in weather patterns is apparent and consistent in the Chilkat River valley.

> We know the valley itself has changed just because of the lay of the land. Alders are everywhere and the brush is going up a lot more than I can remember. Everywhere there is brush now. (CF15)

A subsistence fisher respondent said:

> You know, I definitely have a sense that things are changing, mostly from my garden and from watching the weather patterns and just what my plants have been doing. Like right now I've got bulbs coming up; it's pretty early. And I had lilacs starting to bloom a couple, well not bloom but bud, a few weeks ago, so I have this real definite sense about changing weather patterns. (SUB18)

An additional facet of habitat change possibly stemming from a shifting climate concerns beavers. Subsistence fisher respondents reported that an increase in the beaver population was creating habitat changes for Chilkat River Chinook salmon.

> Oh yeah, they [salmon] are having problems with the beavers. … They [beaver dams] are blocking the salmon streams off so they [salmon] can't get past them to spawn. (SUB05)

Local Knowledge of Development Effects in the Chilkat River Watershed

Respondents shared their observations regarding the building and maintenance of roads or bridges on the Haines Highway, which travels adjacent to the Chilkat and Klehini rivers. The effects of these activities were considered as major factors in the decline of Chilkat River Chinook salmon. In particular, respondents called out increased runoff of oil and other pollutants from the highway and channelization of the river. One respondent cited past gold mining activities at Porcupine Creek in the watershed that diverted tributaries' streams as an example of the effects human activity and resulting channelization can cause.

> … there are places that probably should have had kings, and did have kings 100 years ago, but they re-routed the whole creek for gold mining, put the whole creek in a flume, like Porcupine Creek. They put it in a flume for a mile so there is now no river there, and they just got in and dug the gold out, mined out, diverted the water, and changed the whole thing. (SF01)

Many Chilkat River tributaries are Chinook salmon spawning locations because of their clear waters. A Klukwan elder said:

> [A spawning area] is a place where [salmon] are going to multiply themselves … and [when] those areas, those areas are starved that [is] when we [have a] problem. … [Building] roads, that had a big impact. (SUB01)

Likewise, a commercial gillnetter respondent said that the blasting associated with making new roads interferes with the Chinook salmon run. As evidence, he cited Cannery Cove (Letnikof Cove), explaining one used to be able to catch a lot of Chinook salmon there, but now it is difficult to get anything. This was attributed to the blasting that occurred on Mud Bay Road, which leads to Cannery Cove (CF01). With regard to development along the Haines Highway, another commercial gillnetter respondent said:

> It was initially the change in the road that affected the river so poorly … washed out the spawning beds and just made it so that it washed out the sloughs … they re-did that highway along there, they goofed that all up … . Must have been 10 or 12 years ago maybe more … first the dog [chum salmon] stocks [were affected], the king salmon now. (CF08)

In addition to construction of the highway and other roads, bridge building over Chilkat and Klehini river tributaries along the Haines Highway was reported by several study respondents to have caused significant changes related to hydrological rerouting, channelization, loss of slow-moving sloughs, increased water flow, unnatural fill-in due to the insertion of riprap[2], and a resulting elimination of spawning habitat. Respondents shared specific observations of such effects at Big Boulder Creek (approximately Mile 33) and Little Boulder Creek (approximately Mile 31), both of which were longstanding Chinook salmon spawning

2. Riprap is one or more layers of rock that are placed along river and stream banks or along ocean shores to prevent erosion.

locations. The following comments represent study respondents' observations of change at Big Boulder Creek[3]:

> Big Boulder [Creek], where the kings go, they laid wire in that river. You used to be able to go up there and stand on the bridge and watch these honkin' big kings all over in there and they laid that wiring, that square wire mesh to keep the rocks from rolling out, and that was the end of that run … the fish were gone after that. (CF08)

> They changed the creek so much, and then they [the king salmon] stopped going in there so much. They put the big metal wire baskets with the big rocks in them, and the king salmon never went up after that. (SUB05)

> I can tell you the blasting—making new roads and stuff—interferes with the king salmon run. There is no doubt about it. And, um, Big Boulder Creek, they used to spawn in there. That place used to get so full of king salmon. And they went up there with machines and put rocks on it, and then after they put all the rocks, they fenced it so the rocks wouldn't move, and the king salmon just quit showing up there. … Below Chilkat [Lake], they still come up … I don't know where they go, really. But that's where they used to come up to spawn, and they just quit. You'd be lucky to see one in there [now]. (CF01)

> Big Boulder [Creek], we have lost [that run]. That was a big run when I was growing up. There were so many kings in there. There was trees in it [which slowed the water flow and provided protection for egg deposits] … and kings can spawn there. … [Then] we did that bridge there, put the wires on the banks. The fish couldn't spawn there. It's [the water flow] too fast … lost the spawn you know. We lost the return there. There was [still] a few [Chinook salmon] in there, [but] not like it used to be. (SUB02)

Local Knowledge of Recreational Effects in the Chilkat River Watershed

Another issue of concern consistently discussed by study respondents was the use of the Chilkat and Klehini rivers by commercial jet boat and river-rafting companies whose activities were believed to be generating harmful effects on salmon and salmon habitat in the watershed. Jet boats operate in the Chilkat and Klehini rivers, and recreational and guided rafters usually put in either at the Klehini River itself or at the Wells Bridge, where the Klehini River merges with the Chilkat River, and float downriver from there. Study respondents pointed out that this route travels directly over the route spawning Chinook salmon must use to travel upriver; some of the fish spawn far up the Klehini River. Subsistence fishers interviewed for this study reported concerns that rafts and jet boats travelling through low-water sections are displacing spawning Chinook salmon. For example, a subsistence fisher said that sometimes the river gets very low and then the rafts drag into the river bottom. The respondent was concerned that dragging action is displacing salmon and that the rafters are challenging the movement of the salmon heading to the spawning channel and displacing them back down the river (SUB02).

Subsistence fisher respondents also reported that rafters are often seen jumping out of their rafts and walking through low water in the rivers and suggest that this is also disturbing spawning salmon.

> Rafters [are] coming up and chasing, chasing the fish down, back out of the tributaries and, you know, you get people trampling around on the, on the flats where there is little areas that [salmon] fry may be sitting in. (SUB08)

Respondents reported specific locations where Chinook salmon are known to spawn and where direct effects from recreational and guided rafters have been noticed, particularly in sloughs around miles 13, 15,

3. Big Boulder Creek has been the primary spawning location for Chinook salmon returning to the Klehini River (Elliott 2018). In 2009 and 2013, the year before these interviews occurred, Little Boulder Creek saw a return equal or greater to that of Big Boulder Creek.

and 19 of the Haines Highway, and around the mouth of the Tsirku River, which Chinook salmon enter en route to Chilkat Lake where they spawn. A subsistence fisher explained:

> They're [the rafters] tearing up those spawning beds … [and] they're chasing the fish back down the stream … those [Chinook salmon at the mouth of Tsirku River] go right up to Chilkat Lake. So, if they're chasing the fish back down, the fish only have so much energy to get to the lake … and if they have to go back down and then come back up, and they start coming back up and there's another raft coming back down. … how much energy are they wasting by being chased back downstream by those rafters? (SUB09)

Additionally, subsistence fisher respondents expressed concern that recreational and guided rafters are negatively affecting brush and downed trees on the banks of the river that spawning salmon need for rest, protection, and for habitat for laying eggs.

> … that brush that covers them up, you know, that needs to be retained. You cannot have people, you know, going through and breaking all of that off so that they can make it through with a raft. (SUB08)

Local Perspectives on the Effects of Subsistence, Commercial, and Sport Fishing on Chilkat River Chinook Salmon

Alongside the observations of climatic, developmental, and recreational effects reported by study respondents are strong beliefs that subsistence, commercial, and sport fishing activities have also been a significant cause of the Chilkat River Chinook salmon decline. Some respondents also expressed concern that the ADF&G tagging project (which uses fish wheels and drift gillnets and is undertaken for fisheries management purposes) can also negatively affect the Chinook salmon run. A Klukwan resident explained the gauntlet Chilkat River Chinook salmon must move through each summer in order to successfully arrive at their spawning grounds:

> When [king salmon] try to come back, you know they go through the sport fishing and go through the Fish and Game, and again down, down there about seven–eight miles, and just catching [Chinook salmon] tagging them, and whatever [fish] get [through] that end … . I don't know how many make it, but then they got to go to the fish wheels, eight–nine miles, and [from] there they have to go to subsistence users here by the village … then [they] got to go head up to the spawning area and just before everything is spawned, they got catching them again. (SUB02)

Respondents expressed a variety of perspectives about the threats to Chinook salmon that are presented by each of the three user groups in the study area. Some respondents attributed the decline in Chilkat River Chinook salmon more to the activities of one of these user groups than the others, though none thought the decline could be traced to just one activity. For example, some commercial fishing respondents expressed a belief that Chinook salmon harvesting by subsistence users was the primary negative factor affecting the stock. Other respondents suggested that the non-local sport and guided sport fisheries have the largest effects on the Chilkat River Chinook salmon run, while others believed commercial fishing was taking the greater toll. Generally, those criticizing commercial fishing effects expressed concerns rooted broadly in the full suite of commercial harvesting activities, including those that extend further out into the ocean such as seining, trawling, and winter commercial trolling. This section summarizes all these user groups' activities as presented in the key respondent interviews to provide a more holistic understanding of the calculus of exploitation of Chilkat River Chinook salmon.

Local Perspectives on the Effects of the Subsistence Fishery

At the time of this study, if Chinook salmon were incidentally harvested in subsistence nets, they could be legally retained. Most subsistence fishers maintained that they primarily target sockeye salmon and normally catch only a few Chinook salmon, but some study respondents from all three user groups suggested

that more Chinook salmon are being caught and retained than are reported and that subsistence fishers do intentionally target Chinook salmon. Similar concerns about underreported harvesting of Chinook salmon in the commercial fisheries will be explored in the next section.

Before further delving into the opinions and concerns surrounding the subsistence fisheries, it is worthwhile to note what information has been documented about these fisheries. There are two main sources of data: mandatory annual subsistence salmon harvest permits and periodic voluntary household harvest surveys. For Haines, permit data extend back to 1985 and household survey data are available for 1983, 1987, 1996, and 2012 (Table 3-1; Figure 3-1; Figure 3-2). For Klukwan, subsistence permit data are available beginning in 1989, although permits have not been issued every year to Klukwan residents (Table 3-2). Household harvest surveys have been conducted in Klukwan for 1983, 1987, 1996, and 2014 (Figure 3-3; Figure 3-2). Note that the household survey data reported in tables 3-1 and 3-2 are of salmon harvested with subsistence gear only to maintain comparability to permit data; the data in figures 3-1 through 3-3 are derived from household surveys and report salmon harvested for home use with any gear type. Based on a comparison between the survey data and the permit data for the years in which both data sets were available, it appears that there is some amount of underreporting on the subsistence permits in both Haines and Klukwan for all species of salmon.

For example, based on permit returns, for the period 1985 through 2017, residents of Haines averaged an estimated subsistence harvest of 77 Chinook salmon, with a harvest range of 9 salmon in 2017 to 235 salmon in 2012 (Table 3-1). Household survey data for Haines are available for four study years; the average harvest of Chinook salmon in subsistence nets during these years was 194 fish, with a harvest range of 0 salmon (in 1983 and 1987) to 412 salmon (in 2012). In addition to harvesting salmon with subsistence nets, Haines residents retained Chinook salmon for home use from commercial catches and harvested Chinook salmon with rod and reel, according to household surveys administered for select years. For the four previous study years, a range of 1,171 (±52%) to 1,724 (±34%) Chinook salmon were harvested by all gear types (Figure 3-1).[4] Of an average total harvest of 1,418 Chinook salmon, 38% were removed from commercial harvests, 48% were harvested with rod and reel, and 14% were caught by subsistence nets (Figure 3-4). As can be seen in Figure 3-5, however, the long-term average obscures the changes in harvest by different gear types over time. The number of salmon retained from commercial harvests has varied widely throughout the four study years, with the fewest reported in 1996 (68 salmon) and the most in 1983 (925 salmon) (Figure 3-5). Harvests of Chinook salmon with rod and reel have shown less variation, but the 2012 study year documented the smallest amount of harvest by this gear type: 236 salmon, compared to a high of 966 salmon in 1996. It is possible that as Chinook salmon abundance has declined and rod and reel fishing has become less productive, fishers have relied more upon commercial retention and subsistence gillnets (R. Chapell, Sport Fish Biologist, ADF&G, Haines, personal communication). In only two of the four study years were Chinook salmon harvests with subsistence nets documented during household harvest surveys; harvests were similar in both years: 364 fish (±77%) in 1996 and 412 fish (±40%) in 2012. Permit harvest data show a slightly increasing trend in the number of Chinook salmon harvested over time: the annual average for 2008–2017 was 97 Chinook salmon, compared to the long-term (1985–2017) average of 77 Chinook salmon (Table 3-1). However, Chinook salmon harvests dropped notably beginning in 2015, averaging just 13 salmon from 2015 through 2017. Some of this drop likely stems from ADF&G requesting that fishers release any live Chinook salmon; although the request dates back to 2012, it was more widely observed starting in 2015 when there were also sportfishing closures and cancelation of the salmon derby (R. Chapell, Sport Fish Biologist, ADF&G, Haines, personal communication).

Comparisons between permit data and household survey data illustrate a similar story for Klukwan. In Klukwan, residents harvested an average of fewer than one subsistence Chinook salmon, based on years

4. All confidence interval percentages (CIPs) that are provided in this section are published in the ADF&G Division of Subsistence Community Subsistence Information System (CSIS) database with the exception of CIPs for 2014 results for Klukwan; CIPs for 2014 household survey data were made available by David Koster, Research Analyst, ADF&G Division of Subsistence, "Chilkat Chinook Salmon Ethnography," unpublished data, 2014. The CSIS is accessible online: http://www.adfg.alaska.gov/sb/CSIS/.

with permit returns from 1989 through 2017, with no Chinook salmon harvested reported most years and a high of four Chinook salmon harvested in 2014 (Table 3-2). Spanning the four years of household survey data available for Klukwan, the average harvest of Chinook salmon in subsistence nets was 65 fish, with a harvest range of 49 (±41%) in 2014 to 106 (±29%) in 1996. Similar to Haines residents, during the four study years, Klukwan residents retained Chinook salmon from their commercial catches and harvested them with rod and reel in addition to using subsistence nets. Over the four years of household harvest survey data, a range of 61 (±33%) Chinook salmon in 2014 to 155 fish (±23%) in 1996 were harvested by all gear types (Figure 3-3). Of an average total harvest of 108 Chinook salmon, 10% were retained from commercial harvests, 30% were harvested with rod and reel gear, and 60% were caught using subsistence nets (Figure 3-6). Also similar to Haines, harvests by gear type changed over time. Fewer Chinook salmon were harvested by Klukwan residents in the 2014 study year than in any other survey year; fewer salmon were harvested by each gear type as well, except for commercial retention because there was none documented in 1987 (Figure 3-7). Low Chinook salmon abundance is responsible in part for the low harvests by all gear types in 2014. As in Haines, there appears to be a trend away from harvesting Chinook salmon with rod and reel. Chinook salmon harvests with subsistence gear as a proportion of the total number of harvested fish have been more variable in Klukwan than in Haines, according to survey data. There is not enough permit return data to infer any trends in harvests reported by permits.

There are many reasons why a person might not get a subsistence permit, might not return a permit, or might not fill it out accurately. These range from lack of trust in the management agencies, lack of knowledge about the rules, confusion about how to fill out a permit, or fear of enforcement actions (Fall and Shanks 2000). Based on household surveys, many times more Chinook salmon are harvested with subsistence gear by residents of Haines than by residents of Klukwan, in part because of the dramatically different sizes of communities.

While some subsistence fisher respondents did express concern about retention of Chinook salmon in the sockeye salmon subsistence fishery, commercial gillnetter respondents were the most adamant proponents of the possibility that subsistence incidental harvest is affecting the Chilkat River Chinook salmon population. A commercial gillnetter respondent said:

> I know that subsistence nets have a huge impact [on the Chinook salmon population], there are guys that camp out on their nets all summer long in the river and that has to have an impact. (CF01)

Respondents who were critical of the subsistence fishery were most concerned with effects to Chinook salmon generated by the annual June 1 initial opening of the subsistence fishery in Chilkat Inlet, Lutak Inlet, and Chilkat River. During this time Chinook salmon are still abundant, and these commercial fisher respondents thought that subsistence fishers often purposefully target them. Another commercial gillnetter said:

> That's why a lot of these subsistence fishermen go out early because they want to catch kings … . They're of course hoping to catch some sockeyes, but they know they're also going to get kings in their nets. (CF03)

During this first open subsistence period, commercial fishery respondents believed it was possible to identify fishers who are purposefully targeting Chinook salmon by the location at which they place their nets. A sport angler from Haines said:

> You can tell people are targeting kings if they are right at the hotspots, like they are not out just for the sockeye; they are at the hot, historical trolling king spots with subsistence nets … . And there are sockeye then. People are catching sockeye [but they are also catching kings]. (SF01)

Additionally, those critical respondents said that when subsistence fishers are fishing overnight it is another indicator that Chinook salmon are being targeted. This is because, according to the local knowledge shared by respondents, large pulses of Chinook salmon tend to be present at specific locations in the middle of the night, and these critical respondents report having observed subsistence fishers at these locations from

approximately midnight and later. These respondents also reported concerns that Chinook salmon caught in nets are often too damaged to safely be let go and that, even when fishers release accidentally caught Chinook salmon, the fish's chances of survival is likely often low.

In contrast to the study respondents who are critical of the subsistence fishery, most subsistence fisher respondents expressed adamantly that they diligently avoid accidental harvest of Chinook salmon while subsistence fishing for sockeye salmon. As previously discussed, inriver subsistence fishers reported that they generally always place their nets on the west side of the Chilkat River where, because of shallower water, Chinook salmon are usually sparse but sockeye salmon are normally abundant. One Klukwan elder explained that for generations it has been a longstanding traditional practice of the Chilkat Tlingit to not fish on the east side of the river, for the primary purpose of not harvesting too many Chinook salmon (SUB12). For this reason, and because subsistence fishers are adamant that they do not prefer harvesting or eating Chinook salmon, subsistence fishers interviewed during this study consistently reported that their annual retention of Chinook salmon is very low. One subsistence fisher discussed taking home very few Chinook salmon, and only when those fish die in the net (SUB18). Mostly, this fisher targeted sockeye salmon, and then coho salmon in the fall. This fisher continued to express a lack of preference for using Chinook salmon and instead a preference for using sockeye salmon:

> I don't think that [Chinook salmon are] so much better [eating] than all the other fish. Like, a lot of people think that king salmon are the best fish ever, and I don't necessarily feel that way about them. I would rather have a fish that I know is … relatively plentiful, and is coming back, and I really like to eat. (SUB18)

In contrast to study respondents who believe that the subsistence fishery has generated large-scale negative effects on the Chilkat River Chinook salmon population, other respondents expressed a belief that effects from the subsistence fishery are negligible and that it is instead the commercial or sport fisheries that are mostly responsible for the Chilkat River Chinook salmon decline. For example, a commercial gillnetter respondent said:

> The amount of subsistence fishing that happens on any stock is never going to make a difference … these subsistence levels that people are fishing, you know those aren't making any difference in the health of the stock. It's either commercial fishing or sport fishing that's happening that is making the impact, I think. I don't think the subsistence makes any effect on any fishing. (CF03)

A final concern with the subsistence fishery, one that will be repeated in the commercial and sport fishing sections, had to do with lack of accurate reporting. Multiple respondents judged that the numbers of harvested Chinook salmon are not being accurately monitored and accounted for in the subsistence fishery and noted that there is no mechanism to monitor the mortality of caught-and-released Chinook salmon. One commercial fisher respondent said that official reporting of subsistence harvests through the subsistence salmon permit system was generally low. Another subsistence fisher shared an opinion that everyone using the river is catching too many Chinook salmon (SUB12). Moreover, a couple of study respondents who were critical of the subsistence fishery expressed a belief that subsistence-caught Chinook salmon were being smoked and then sold for money in a regional black market. Respondents opined that there is very little effort by law enforcement to monitor possible illegal Chinook salmon harvests and underground sales in the region. There are no data that suggest Chinook salmon are harvested in amounts larger than what was estimated from the household surveys, nor are there data to suggest that salmon harvested in subsistence fisheries are sold.

Table 3-1.–Estimated subsistence salmon harvests, from permit returns and household surveys, Haines, 1983–2017.

	Permits[a]		Estimated salmon harvest from permits						Estimated salmon harvest from surveys					
Year	Issued	Returned	Chinook	Sockeye	Coho	Chum	Pink	**Total**	Chinook	Sockeye	Coho	Chum	Pink	**Total**
1983	ND	ND	ND	ND	ND	ND	ND	**ND**	0	3,233	67	2,335	90	**5,725**
1984	ND	ND	ND	ND	ND	ND	ND	**ND**						
1985	ND	147	19	3,119	12	446	206	**3,802**						
1986	ND	199	28	3,940	26	355	52	**4,401**						
1987	ND	217	34	3,912	5	645	160	**4,756**	0	3,039	0	113	127	**3,279**
1988	ND	186	93	3,845	37	1,116	444	**5,535**						
1989	ND	226	12	5,205	52	520	680	**6,469**						
1990	ND	203	62	6,520	103	584	854	**8,123**						
1991	ND	291	54	8,318	90	592	99	**9,153**						
1992	ND	281	21	8,273	220	823	836	**10,173**						
1993	ND	283	43	7,498	210	524	160	**8,435**						
1994	ND	267	56	6,067	189	584	1,263	**8,159**						
1995	ND	242	59	5,884	321	902	352	**7,518**						
1996	461	446	68	7,908	203	751	350	**9,281**	364	12,379	1,915	2,618	830	**18,106**
1997	517	491	31	5,668	140	750	872	**7,460**						
1998	305	256	57	5,759	194	678	656	**7,345**						
1999	321	288	57	5,676	130	969	702	**7,535**						
2000	302	273	53	5,151	244	853	432	**6,732**						
2001	325	291	82	6,045	135	493	554	**7,309**						
2002	334	310	88	5,572	604	513	806	**7,584**						
2003	351	322	112	6,571	526	668	1,138	**9,015**						
2004	349	334	190	6,394	473	719	1,445	**9,222**						
2005	342	331	96	4,652	329	597	1,461	**7,134**						
2006	354	330	134	6,149	392	597	1,437	**8,709**						
2007	363	300	115	5,833	151	253	707	**7,059**						
2008	393	384	64	7,136	393	765	644	**9,002**						
2009	411	405	91	7,244	462	454	1,498	**9,749**						
2010	326	314	110	7,909	334	291	1,295	**9,940**						
2011	438	421	175	6,920	307	526	2,725	**10,654**						
2012	426	406	235	7,245	177	349	679	**8,686**	412	8,229	521	595	1,480	**11,236**
2013	434	419	155	7,391	453	486	1,387	**9,872**						
2014	442	437	102	7,819	444	169	565	**9,100**						
2015	406	397	17	4,748	314	396	2,055	**7,530**						
2016	460	431	13	9,275	297	533	943	**11,060**						
2017	418	390	9	5,166	228	339	2,791	**8,533**						
5-year avg (2013–2017)			59	6,880	347	384	1,548	**9,219**						
10-year avg (2008–2017)			97	7,085	341	431	1,458	**9,412**						
Historical avg (1985–2017; 4 survey years)			77	6,206	248	583	917	**8,031**	194	6,720	626	1,415	632	**9,587**

Source ADF&G Division of Subsistence, ASFDB 2018 (ADF&G 2020).

Note "ND" indicates no data are available.

Note Blank cells indicate no household survey occurred.

a. From 2001 to the present, the number of permits is based on the place of residence of the permit holder. Before 2001, it is uncertain if the number of permits is based on place of residence or mailing address.

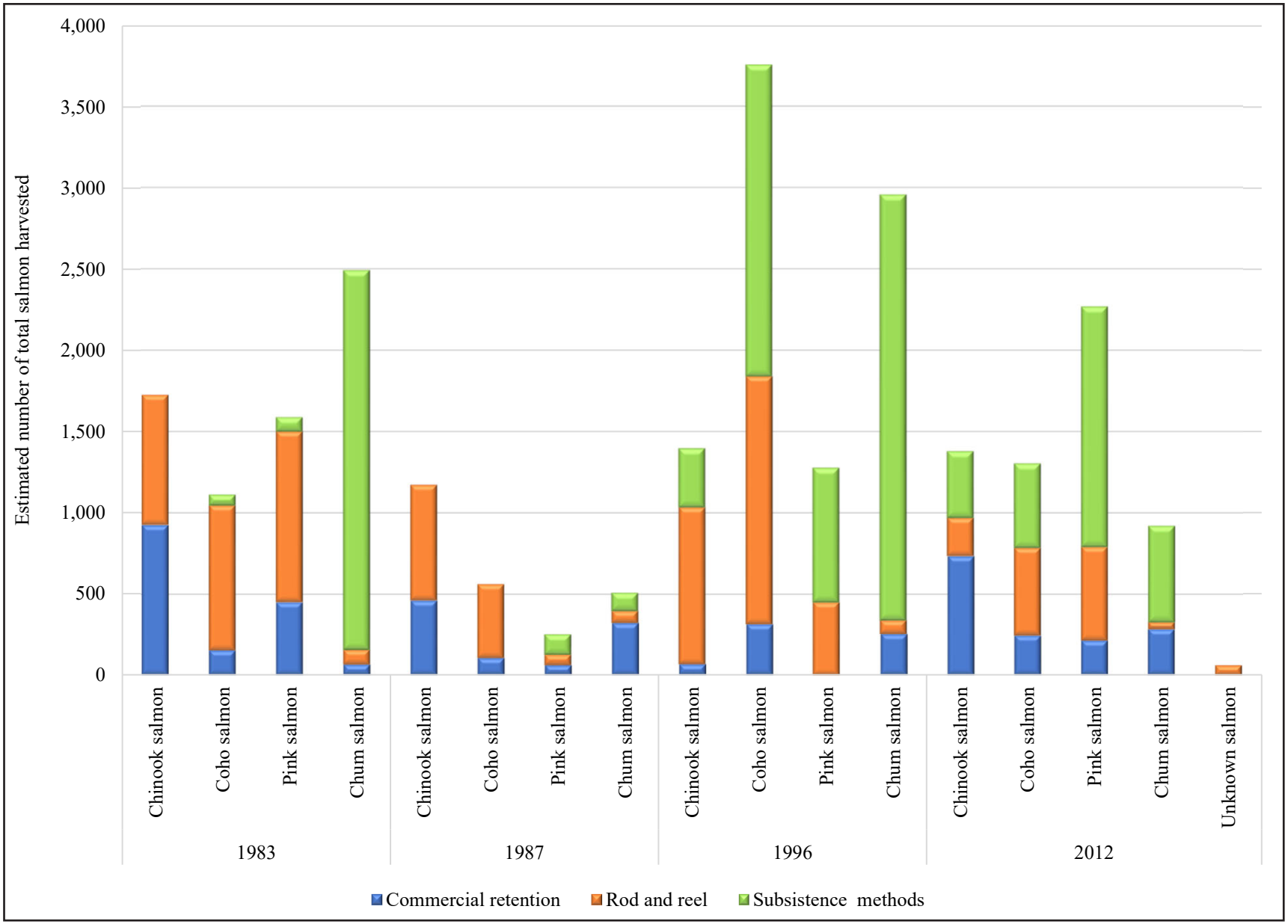


Figure 3-1.–Estimated salmon harvest, by species and gear type, Haines, 1983, 1987, 1996, and 2012.

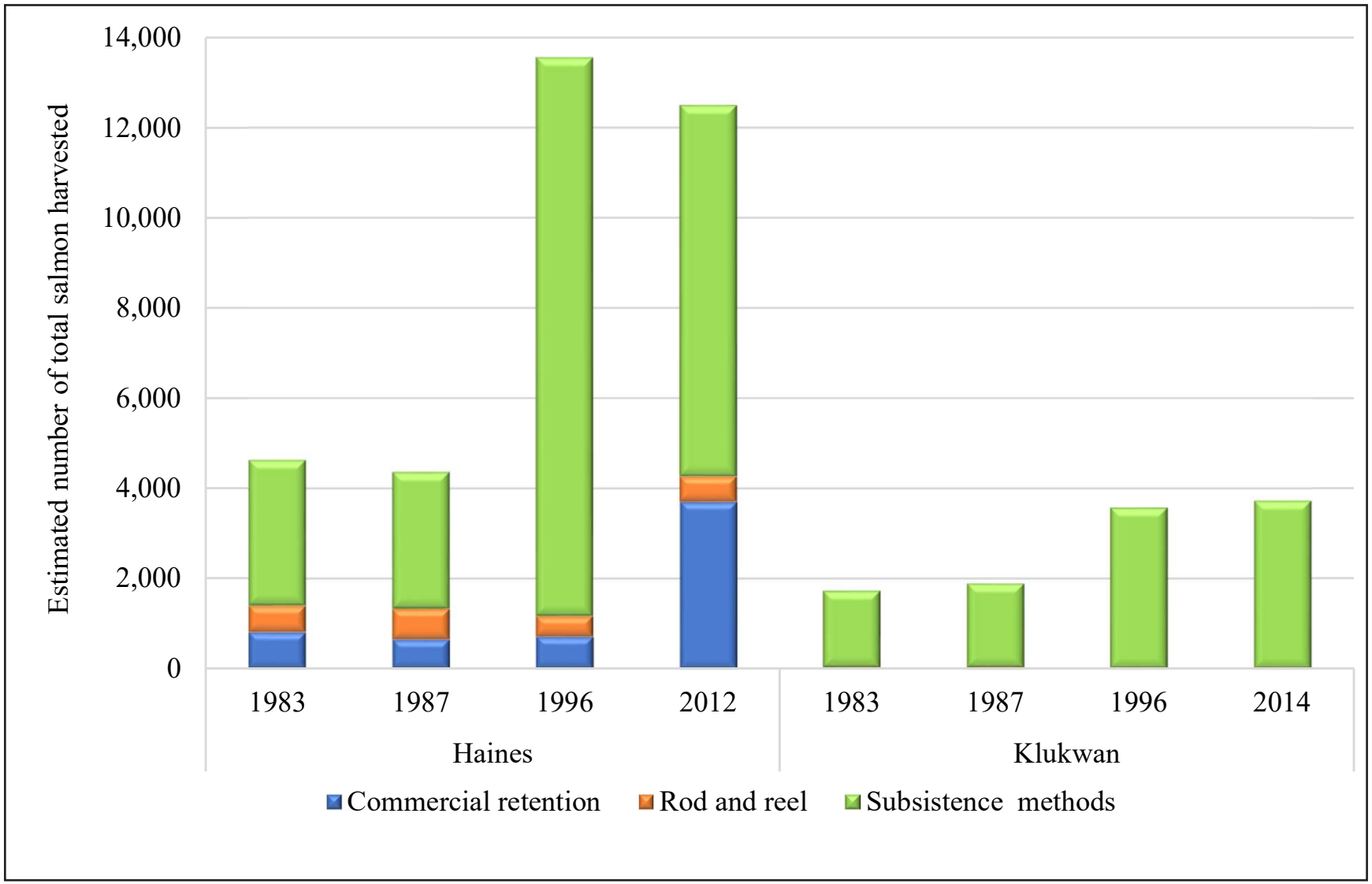


Figure 3-2.–Estimated sockeye salmon harvest, by gear type, Haines, 1983, 1987, 1996, and 2012, and Klukwan, 1983, 1987, 1996, and 2014.

Table 3-2.–Estimated subsistence salmon harvests, from permit returns and household surveys, Klukwan, 1983–2017.

	Permits[a]		Estimated salmon harvest from permits						Estimated salmon harvest from surveys					
Year	Issued	Returned	Chinook	Sockeye	Coho	Chum	Pink	**Total**	Chinook	Sockeye	Coho	Chum	Pink	**Total**
1983	ND	ND	ND	ND	ND	ND	ND	**ND**	52	1,707	24	24	130	**1,937**
1984	ND	ND	ND	ND	ND	ND	ND	**ND**						
1985	0	0												
1986	0	0												
1987	0	0							52	1,870	164	694	124	**2,904**
1988	0	0												
1989	ND	1	0	173	0	23	0	**196**						
1990	0	0												
1991	ND	1	0	39	0	1	0	**40**						
1992	0	0												
1993	0	0												
1994	0	0												
1995	0	0												
1996	0	0							106	3,577	496	1,008	29	**5,216**
1997	0	0												
1998	0	0												
1999	0	0												
2000	2	2	0	49	0	34	2	**85**						
2001	0	0												
2002	3	3	1	78	0	0	2	**81**						
2003	0	0												
2004	0	0												
2005	1	1	0	0	0	0	0	**0**						
2006	0	0												
2007	0	0												
2008	0	0												
2009	3	3	0	78	1	0	7	**86**						
2010	2	2	0	63	10	14	22	**109**						
2011	0	0												
2012	10	9	1	414	39	72	20	**547**						
2013	9	9	0	424	13	39	54	**530**						
2014	10	10	4	364	46	25	4	**443**	49	3,732	344	37	13	**4,176**
2015	10	9	0	224	30	12	26	**292**						
2016	12	9	0	388	13	17	13	**432**						
2017	13	10	0	169	43	25	55	**291**						
5-year avg (2013–2017)			1	314	29	24	30	**398**						
10-year avg (2008–2017)			1	266	24	26	25	**341**						
Historical avg (years data are available)			0	190	15	20	16	**241**	65	2,722	257	441	74	**3,558**

Source ADF&G Division of Subsistence, Alaska Subsistence Fisheries Database (ASFDB) 2018 (ADF&G 2020).

Note "ND" indicates no data are available.

Note Blank cells indicate no household survey occurred or no harvest estimate based on permits is available because no permits were issued.

a. From 2001 to the present, the number of permits is based on the place of residence of the permit holder. Before 2001, it is uncertain if the number of permits is based on place of residence or mailing address.

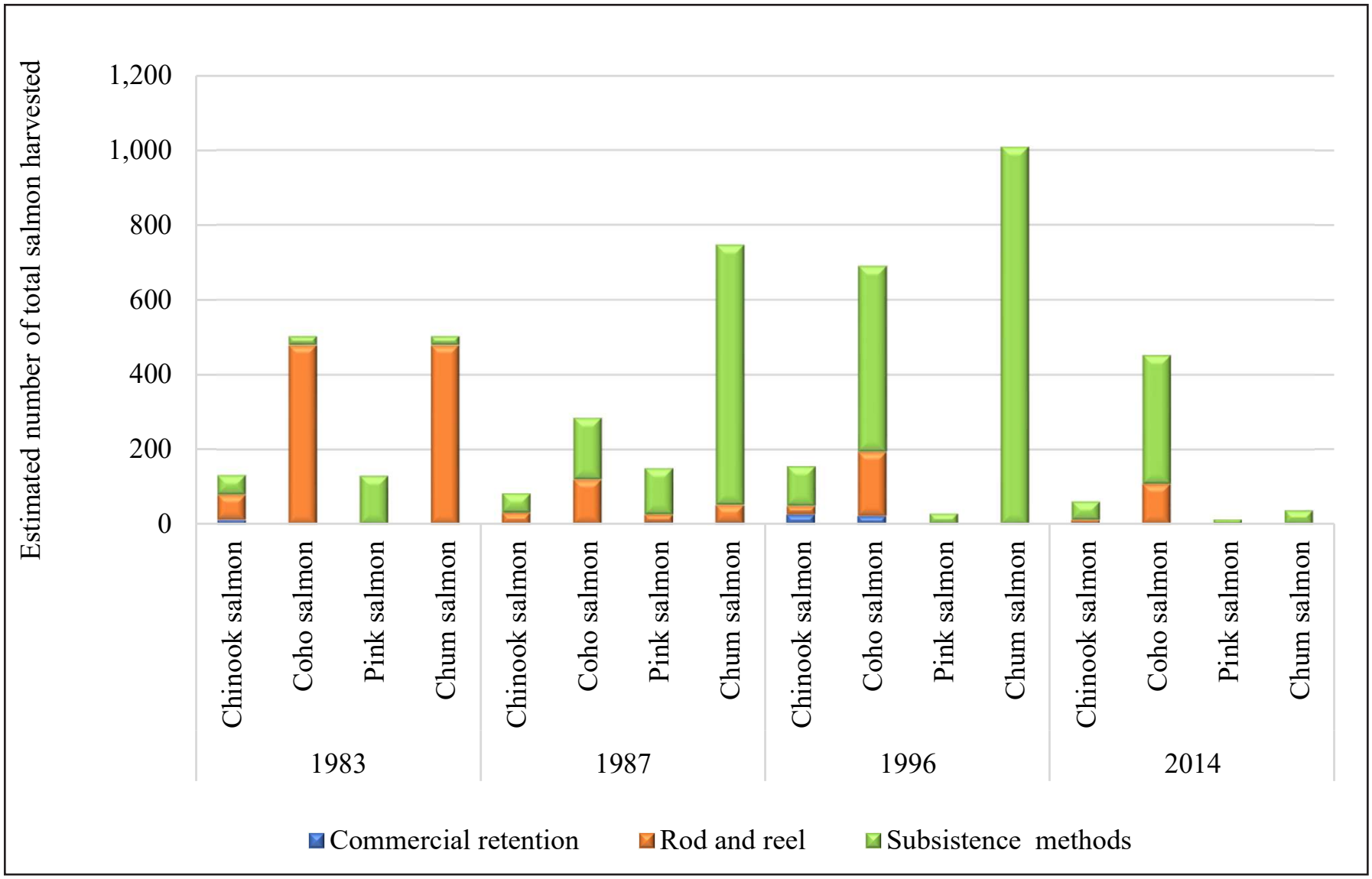
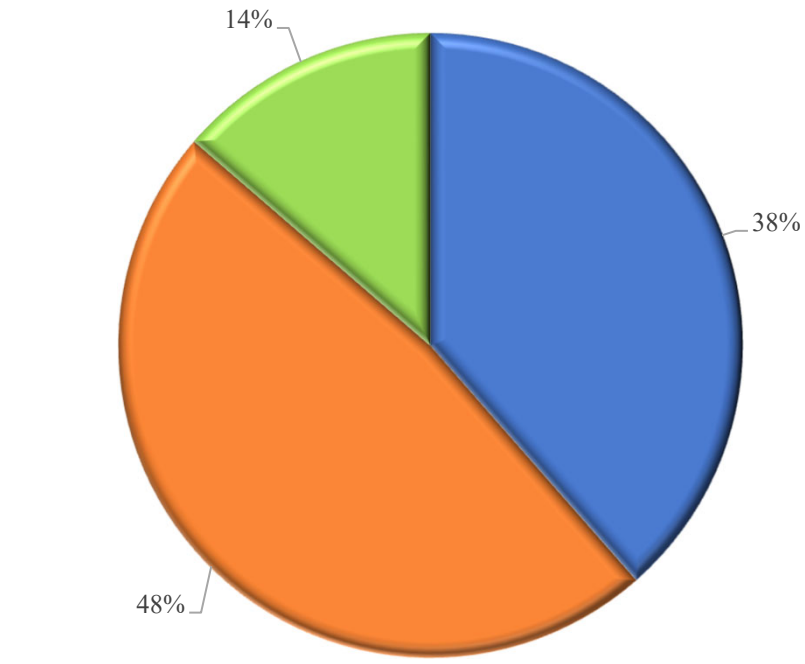


Figure 3-3.–Estimated salmon harvest, by species and gear type, Klukwan, 1983, 1987, 1996, and 2014.



Note These percentages are based on the Chinook salmon harvested by known gear type only.

Figure 3-4.–Composition of Chinook salmon harvest by gear type, from total average harvest based on household surveys, Haines, 1983, 1987, 1996, and 2012.

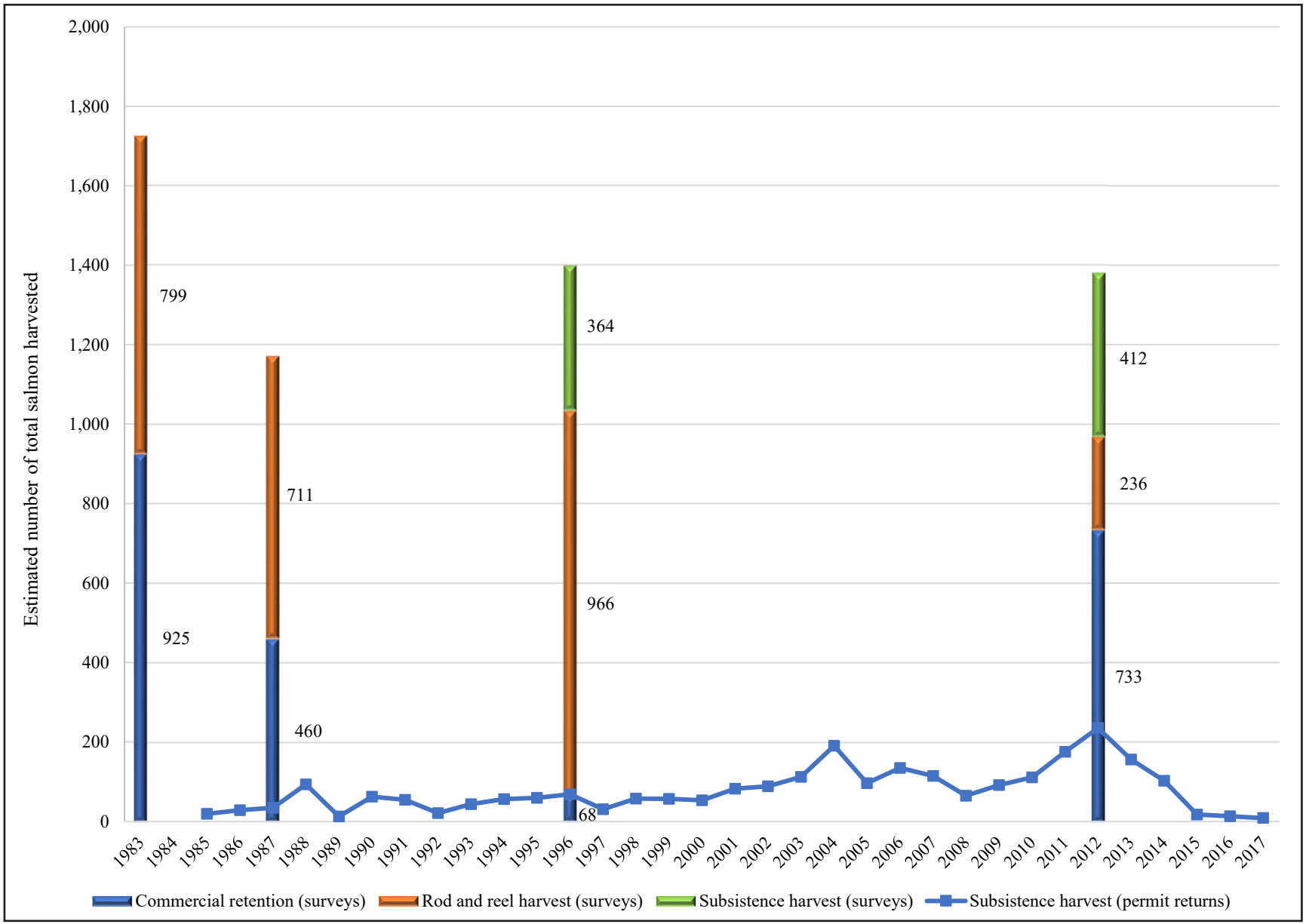


Figure 3-5.–Estimated Chinook salmon harvest by gear type based on household surveys, and estimated subsistence Chinook salmon harvest based on permit returns, Haines, 1983–2017.

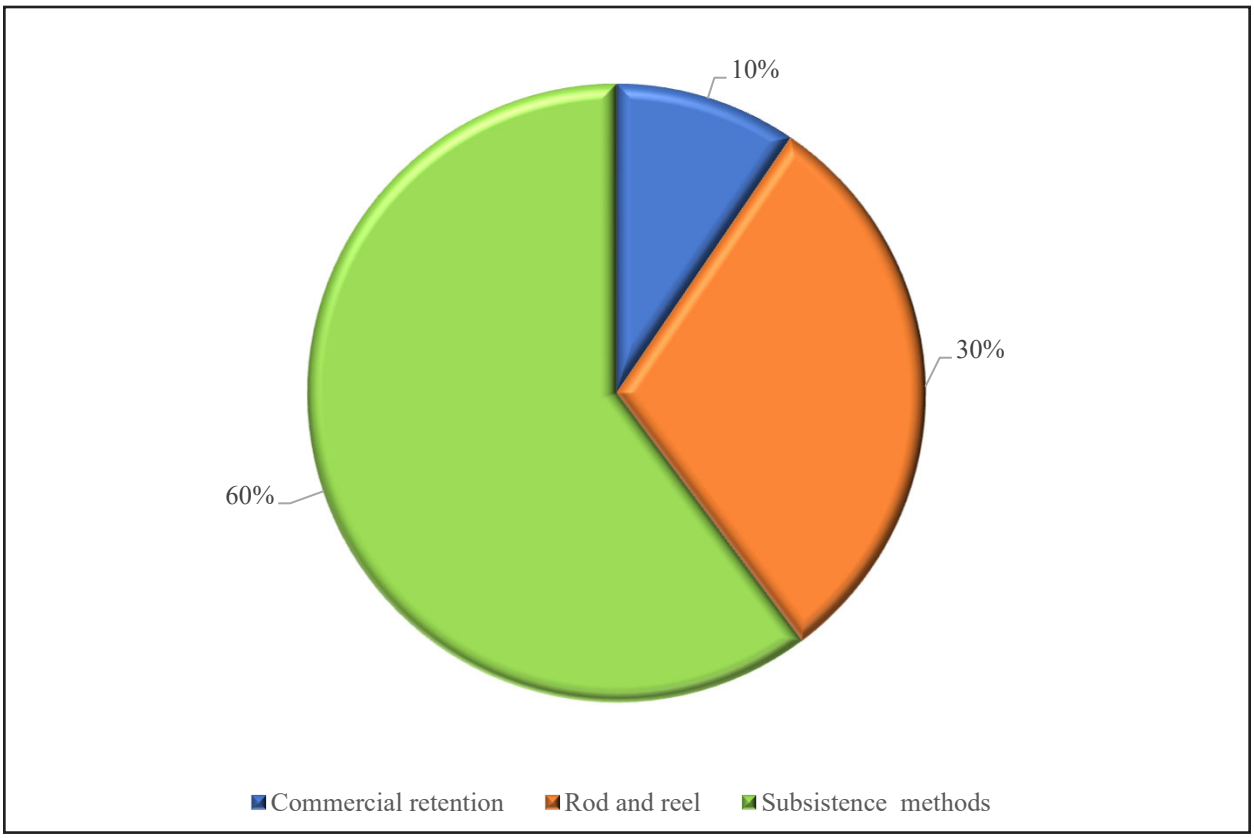


Figure 3-6.–Composition of Chinook salmon harvest by gear type, from total average harvest based on household surveys, Klukwan, 1983, 1987, 1996, and 2014.

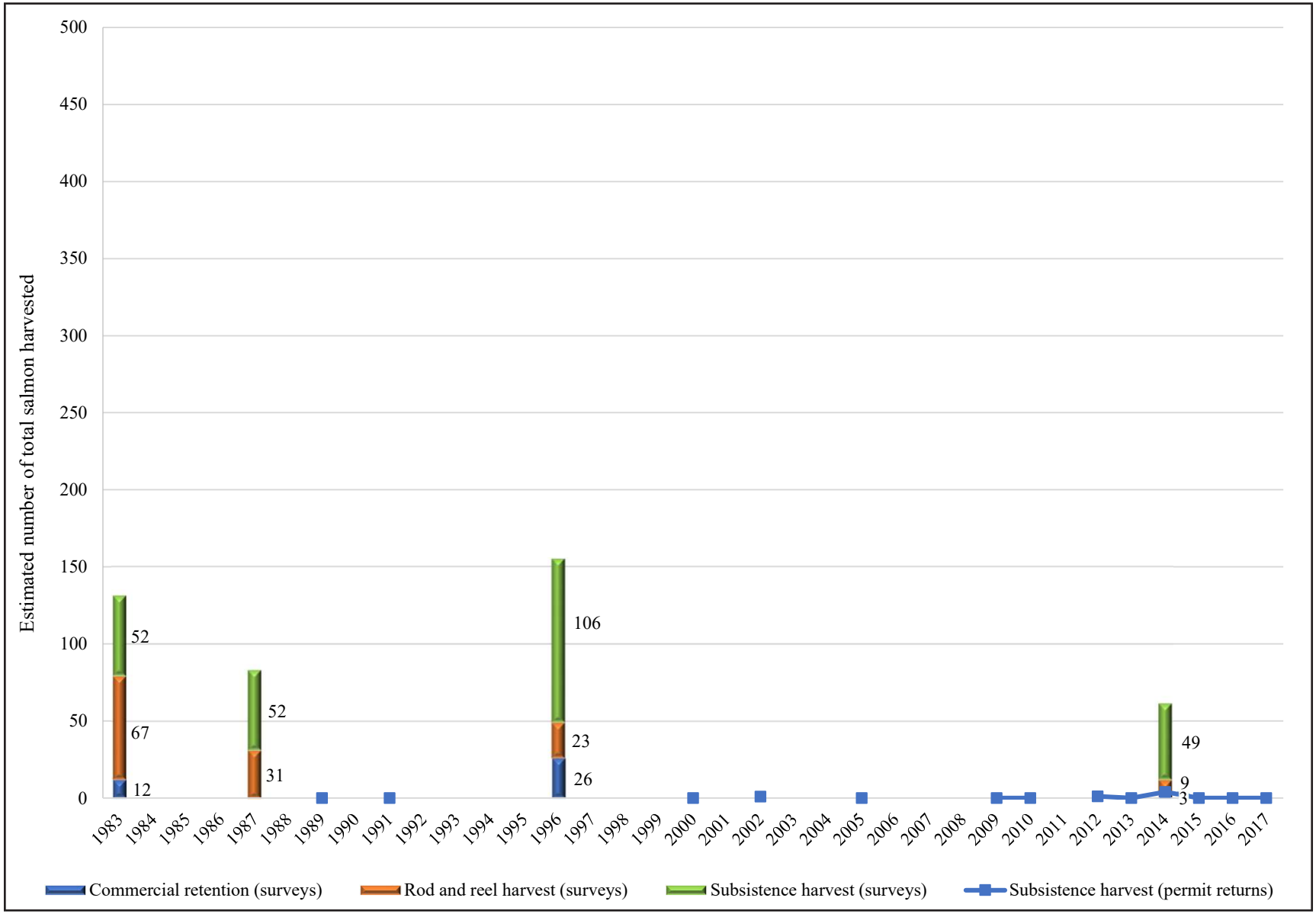


Figure 3-7.–Estimated Chinook salmon harvest by gear type based on household surveys, and estimated subsistence Chinook salmon harvest based on permit returns, Klukwan, 1983–2017.

Local Perspectives on the Effects of Commercial Fisheries

Study respondents' perspectives on the effects of the commercial fishery are more complex than those regarding the subsistence fishery. Discussions about the commercial fishery concerned four separate fisheries: the salmon driftnet fishery in District 15, the regionwide salmon troll fishery, the Southeast salmon purse seine fishery, and the pollock trawl fishery that operates in offshore waters. With the exception of the trawl fishery, the majority of participants in these fisheries are Alaska residents, many of whom reside in Southeast Alaska. The District 15 driftnet fishery has the most participation by Haines residents. Each of these commercial fisheries was reported by local knowledge holders to present different degrees of influence on the Chilkat River Chinook salmon population. None of these fisheries target Chilkat River Chinook salmon and only the winter troll fishery targets Chinook salmon generally. Chilkat River Chinook salmon may be harvested incidentally in any of the commercial fisheries, however.

The Local Drift Gillnet Commercial Fishery

The commercial respondents for this project all were participants in this fishery, either at the time of the interview or in the past. Most commercial fisher respondents reported that effects on Chilkat River Chinook salmon from the commercial driftnet fishery are negligible, suggesting that the majority of Chinook salmon harvests in the Chilkat River watershed—including the salt waters of Chilkat Inlet, as well as the Chilkoot, Taiya, and Lutak inlets—are taken from local subsistence and sport fisheries or non-local commercial fisheries. In part, respondents believed the effects were minimal because the local commercial fishery primarily targets sockeye and chum salmon rather than Chinook salmon; comments by a Haines commercial gillnetter were illustrative of this point:

> I don't target kings. … The sockeyes are what everybody wants. The natural runs. Then we don't have to depend on dogs so much. Everybody is [also] dependent on the dogs to show back up [following the sockeye runs]. (CF14)

The fishery operates with a regulation (5 AAC 33.310(c)(5)) that prevents the gillnet fleet from fishing District 15 until after the third Sunday in June. The intent of this regulation is to allow sufficient time for spawning Chinook salmon to exit Chilkat Inlet and move into the Chilkat River before commercial gillnetting begins. Additionally, if the Chinook salmon run is projected to be weak, the Lynn Canal fishery management plan specifies time and area closures within Chilkat Inlet for the commercial fleet to ensure adequate Chinook salmon escapement (5 AAC 33.384(c)(1)). A commercial fisher respondent said:

> So maybe by July fourth or something we [commercial gillnetters] are moving in [up Chilkat Inlet] a little bit, if there are fish [sockeye salmon present]. Sockeyes are what we are targeting, and by then the king salmon have moved into the river. I like to think it works pretty well as far as that goes with the [local drift gillnet] commercial fishery. (CF12)

Commercial gillnetter respondents believed that, because of this management regime, during times when spawning Chinook salmon are most vulnerable, they are under little commercial pressure locally and that commercial harvests of spawning Chinook salmon are minimal. For example, a commercial gillnetter respondent said:

> I know gillnetters don't catch many [spawning Chinook salmon], at least up here [in Lynn Canal] where we're fishing. Nobody hardly ever sells them [if they are caught] they bring them home to eat them … . But I don't think we're catching very many. (CF08)

Commercial gillnetter respondents reported that while they do not target Chinook salmon in the driftnet fishery, some spawning Chinook salmon are caught, and that sometimes a considerable amount of juvenile feeder Chinook salmon are caught.

> We'll catch some of these Chilkat [River Chinook salmon] and some [Chinook salmon] headed for the Stikine [River], most of our fish are feeders that are swinging through the gulf and headed south. (CF06)

One respondent explained that commercial driftnets generally try to avoid the incidental harvest of Chinook salmon and avoid areas where they have a large chance of intercepting spawning Chinook salmon. "The big [Chinook salmon] spawners are closer to [the] mouth of the river," said the respondent (SF01). Two respondents believed that hatchery Chinook salmon[5] are also caught in the commercial driftnet fishery.

> We do catch some from the enhanced king run that goes up to Skagway … and I think a lot of the fish, the feeders that are caught, are for that. (CF12)
>
> We get the Skagway kings mixing in every once and a while; the hatchery fish and they're different than the natural ones. (CF14)

One commercial gillnetter respondent also commented that, unlike for spawning salmon, interception of "feeder" Chinook salmon is unpredictable and fluctuates from year to year. "Feeder" fish are those Chinook salmon that are still living and feeding in the salt water and have not returned to the river system for spawning at the time of capture. "Every year is just different as far as feed stocks and where they [feeder Chinook salmon] are. Just every year is different," explained a respondent (CF06). Speaking about one area where Chinook salmon are known to be encountered, a respondent said: "They're all feeders. They're [feeding] on other fish, you know, and they come up at night and so they're feeding on something and so they're coming up at night" (CF09).

Depending on the conditions and time of the year, local commercial gillnetters do catch Chinook salmon as incidental harvest, which are either sold to commercial tenders, kept for home use, or let go.[6] A commercial fishing respondent reported that most of the salmon retained for personal use are sockeye salmon, with Chinook salmon kept on occasion. Commercial gillnetter respondents said that larger Chinook salmon, or juveniles that are dead when extracted from the net, are frequently retained for personal use. As such, according to one subsistence fisher respondent, rather than monetary gain "the benefit [of incidentally harvested Chinook salmon] would be if you're a commercial fisherman, you take that fish home and you eat it" (SUB18). When Chinook salmon are incidentally harvested, nearly all of the commercial gillnetter respondents interviewed reported that they are appreciated. "King salmon is a treasure to take home for the winter" (CF01). Depending on the individual, commercial fishing respondents reported that they retain anywhere from one to 15 Chinook salmon as home pack annually. Retaining or not retaining Chinook salmon for personal use from the commercial fishery is often a logistical decision based on desire for home use, current market prices, harvest timing, and conservation concerns. The following statements from commercial fishery respondents illustrate the logistical considerations of commercial fishers when deciding whether to retain or not to retain Chinook salmon caught in their nets:

> I pretty much keep any king salmon that I catch in my net. I'm not going to sell it to my buyer because they're so valuable on a personal level. (CF03)
>
> I never have any time to subsistence fish in the river so it's just way easier to bring 10 [Chinook salmon] home, so I've always done that … I'll do 10 freshpack … I'm usually good on that … that will usually get me [through the winter], you know between halibut and shrimp and everything else. (CF16)
>
> I probably eat four or five a year, but I bet I give five or 10 away before, you know, like if somebody has done a favor for me when I was short on fish, whatever, you know, that kind of barter stuff, subsistence sort of stuff, and that's what a lot of people end up doing. (CF09)

5. ADF&G ceased releasing Chinook salmon into Pullen Creek in Taiya Inlet after the 2015 release due to irregular brood stock and insufficient funds:
   Jillian Rogers, "Skagway's Pullen Creek Open to Sport King Fishing," *KHNS FM*, July 15, 2016, https://khns.org/skagways-pullen-creek-open-to-sport-king-fishing (accessed October 2021).
6. In 2014, 1,338 Chinook salmon were harvested in the District 15 drift gillnet fishery (Gray et al. 2015) and 105 Chinook salmon were reported as home pack on fish tickets from this fishery (Justin Daily, Analyst/Programmer 4, ADF&G, Douglas, personal communication, August 27, 2021).

> If they just hit and they're all feisty and I'm sure they're going to live, I will throw them back. Especially, when we don't get paid anything for them. (CF17)
>
> If they're alive I don't keep them. Because they don't pay us enough. Bring them back for people and share them … if it's like the last day of the opening. … If we're on a three-day opening I catch them the first or second day I usually won't keep them. I like to get them fairly fresh. I don't want them sitting in the boat two or three days. (CF08)
>
> I'm one of those fishermen that if I catch a steelhead [trout] or a king … I might keep them, but if they're still alive I usually throw them back and hope to God that they make it on up to where they're going and reproduce … but if I catch a king salmon that's obviously compromised or a steelhead that's compromised, I'm going to keep them. (CF03)

There were several respondents, however, who expressed concern about possible negative effects stemming from local commercial Chinook salmon incidental harvest. While there are reports of incidental harvested Chinook salmon being sold to commercial tenders, Chinook salmon retained for home use may not always be accounted for with harvest reporting, and some respondents suggested that the level of these harvests is more substantial than is being disclosed. "I know we catch [Chinook salmon] and a lot of us do not report it" (CF05). There have been few studies focusing on the accuracy of fish ticket data in the local commercial gillnet fishery, but one study conducted in the 1990s concluded that Chinook salmon harvest was underreported in this fishery (Ericksen and Marshall 1997).

Of most concern to study respondents is a belief that large numbers of incidentally harvested Chinook salmon are often not kept even if they are no longer alive and that this mortality also goes unreported. Respondents said that small (shorter than 28 in) Chinook salmon are vulnerable to being caught in nets and often do not survive to be returned to sea. Moreover, respondents reported that commercial fishermen often do not want to retain these small Chinook salmon because they are more of a hassle than sockeye salmon to care for properly en route to market, thus making the effort to preserve them not worth the benefit of selling them; these fish are commonly referred to as "jacks," which are small Chinook salmon, typically male, that mature after spending only one winter in the ocean.[7] "Jack salmon is a very fragile fish. You need to clean it right away. It will kind of rot on you and you need to keep it packed in ice. You can't put it in a slush tank" (CF12). Another respondent said:

> [Commercial fishers] don't want [small Chinook salmon]. Selling [small Chinook salmon] isn't good for [commercial fishers]. They don't want to deal with keeping them separate. They don't want to deal, and [dead small Chinook salmon] stink to high heaven … . You know, unfortunately, a lot of guys probably throw those fish right back over. That's really what probably what a lot of guys do. (CF09)

A sport angler respondent, who formerly commercial fished, expressed a divergent viewpoint: "We were letting [juvenile Chinook salmon] go. You can sell them for $2 a pound or a dollar a pound, but we [let] most of them go if we can" (SF01).

Study respondents who thought that the local commercial driftnet fishery affects Chilkat River Chinook salmon more than is being acknowledged expressed concern that mortality levels for incidental catches of small Chinook salmon that are thrown overboard are high enough to be causing a severe change to Chinook salmon populations. A sport angler respondent said: "There is a lot of pressure. There is a lot of gillnetting. And these fish are in the Lynn Canal the whole time. It is surprising that there are really as many as there are, really, when you see the gillnet fleet out there" (SF01). Yet even while respondents do express concern regarding the effects of the local commercial gillnet fishery, all study respondents expressed much larger apprehension about the possible effects to Chinook salmon being generated by the activities of the commercial seine and trawl fisheries.

7. Alaska Department of Fish and Game, "Chinook Salmon." Last modified 2008. https://www.adfg.alaska.gov/static/education/wns/chinook_salmon.pdf (accessed April 2020).

The Commercial Seine and Trawl Fisheries

Regarding the disparate positioning of the different commercial fishing operations in the region, a commercial gillnetter respondent said the following:

> I am just the guy who waits at the end of the chain. Gillnetters are usually at the end. You have trawlers and seiners out front, and [after they harvest] finally the fish get up close to the [Chilkat] river and the gillnetters get access to them. [Alaska Department of Fish and Game says,] "We need fish in the river," and [then] the gillnetters stop [fishing] and we let the fish up the river. (CF12)

Another commercial gillnetter respondent said:

> If we're going to have an end to gillnetting and fishing in this state, it's going to be because of seine boats. I'm sorry to say it but they do whatever they want, they fish wherever they want … . So they will be the end of fishing in Alaska, I guarantee it. It's almost there now, [salmon runs in] at least two lakes up here are almost completely wiped out now. [Commercial seiners] are not letting nothing come through. (CF08)

In conjunction with seiners, study respondents were most apprehensive about large-scale industrial trawlers that fish commercially further out in the ocean. This is an international fleet that harvests fish on a greater scale than the other commercial fisheries that is of concern to respondents. A commercial gillnetter respondent said: "You've got consumers that are not even in our country … you've got international fisheries going on with the same stocks [that we fish locally]" (CF09). "We're all starting to learn here more and more that there's a tremendous bycatch problem with the trawl fleet. It's also proven that they catch a lot of king salmon[8] [as incidental harvest]" (CF05). Another commercial gillnetter said:

> I think a person needs to worry about more honest reporting on bycatch … and I'm thinking more about the guys out in the ocean; the Japanese and the Russians and the American trawlers … . I spent 10 years in a cannery working for [a large-scale industrial trawler operation] and I know for a fact that they were actively making sure that they underreported fish. (CF16)

Study respondents said that by using large nets that drag across, or just above, the ocean floor, trawl systems are designed to harvest whatever comes in the net. These fisheries do not target Chinook salmon and by regulation cannot sell any salmon caught incidentally. However, Chinook salmon harvested in trawl nets likely do not survive and thus are often thrown back in the ocean dead. Trawling is not allowed in Southeast Alaska, and most of the trawling activity in the Gulf of Alaska occurs in the central and western portions.

Respondents also said that expanding technological capacity has improved the capability for commercial vessels to quickly travel to fishing hotspots and to locate salmon. "Boats can travel pretty much everywhere now," said a respondent from Klukwan speaking of the seine fishery (SUB17). Likewise, a commercial gillnetter respondent said: "Plus all the machinery they are using on the boats now: depth sounders, and fish finders" (CF01).

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8. As an example, spanning 2003–2009, Gulf of Alaska groundfish trawl fisheries incidentally harvested an average of 20,793 Chinook salmon (NPFMC 2010:14). In the Bering Sea Aleutian Islands pollock fishery over the same years, the average incidental Chinook harvest was 57,636 fish (NPFMC 2015). However, these fisheries occur geographically far from Southeast Alaska and have a low likelihood of intercepting Southeast Alaska stocks. Because of the inside-rearing nature of Chilkat River Chinook salmon stocks, they are at even less risk of being intercepted in these fisheries. The majority of this incidental harvest occurs in the central and western regulatory areas of the Gulf of Alaska. In 2016, less than 0.5% of the incidental Chinook harvest in any Gulf of Alaska trawl fishery came from the group of stocks that include Chilkat River spawning tributaries (Guthrie III et al. 2018).

The Winter Troll Commercial Fishery

Another commercial fishery that some respondents believe could be negatively affecting the Chinook salmon population is the regional commercial troll fishery, which targets Chinook salmon inhabiting salt water during the winter months. A commercial gillnetter respondent said:

> I know the commercial trollers, for several years they didn't get to fish kings at all … but now that winter king fishery, you know how many kings are they catching in the winter? That's open all winter long [around] Sitka. It's open for the whole winter … that's where them guys are making all their money. They don't make it in the summer now, they do it in the winter fishery now, [fishing for] kings … who knows how much they're catching there all winter every year. There's a lot more guys trolling [in winter] now than there used to be, because you get 7, 8 ,10 bucks a pound [for winter Chinook salmon] sometimes. (CF08)

Respondents discussing winter trolling for Chinook salmon said that during late-winter through late-spring commercial trollers that catch Chinook salmon while fishing at Cross Sound and Homeshore are likely harvesting Chinook salmon that would be making their way to the Chilkat River to spawn.

Local Perspectives on the Effects of the Sport Fishery

Along with possible effects generated by the subsistence and commercial fisheries, many study respondents also expressed concern that the local sport fishery has had a degree of negative implications for the Chilkat River Chinook salmon population. These concerns centered around the activities of sport fishing charter operations, excessive use of the area by Canadian sport anglers from Yukon Territory (YT), and the effect of the annual Haines King Salmon Derby.

Under state regulations, rod and reel is not a legal gear type for subsistence harvests in the Haines Management Area; therefore, many residents also harvest fish for home use under sport fishing regulations. Using rod and reel, Chinook salmon are caught by boat while trolling in salt water near the shore. Sport fishing can occur year-round, but May and June are considered to be the prime opportunities for catching Chinook salmon in marine waters, but not in the Chilkat River. "No. You are not allowed to [sport fish for kings in the river], and the water is muddy [in the river] during the king season so it is not really going to happen," explained a respondent who is primarily a sport fisherman and obtains all of his home use fish by sport trolling (SF01). The respondent continued:

> So you can catch like 10 halibut a day trolling and you catch kings while you do it. So I am always fishing for kings now. I just always use a herring instead of big halibut bait so you can catch a king anytime … . You are glad to catch one [king salmon] and you keep it and you're done. … They brought [the daily limit] way down because the [Chinook] returns were lower. … I would probably keep an average of about, personally 10 [Chinook salmon], over the course of a month-and-a-half of fishing for spring fish. (SF01)

Respondents reported that the number of sport fishing charters operating out of Haines has increased over recent years.

> That [charter boats targeting Chinook salmon] has to do a lot with this [salmon declines]. Instead of a couple hundred people sport fishing in Alaska like the locals, now you've got thousands of them doing it. (CF08)

A middle-aged commercial gillnetter respondent who was born in Haines said:

> When I was young, growing up here, most nights you wouldn't see one boat out there. If you saw two or three boats out there that was a lot. Now they are everywhere … sport guys … I think this certainly has an impact. You see 15, 20 boats today … there are tons of Canadians that come down [and fish out of] Skagway and [Haines]. Certainly, there is lots and lots of more effort than years ago. I think that is a big part of [the Chilkat River Chinook salmon decline]. (CF17)

Respondents consistently mentioned that Canadian sport anglers, mostly from Whitehorse, YT, frequently travel across the border for sport fishing, largely to target Chinook salmon. Whitehorse is one of the nearest communities to Haines accessible by road. ADF&G offers a non-resident sport fishing license to YT residents at the same cost as for Alaska residents. Respondents voiced suspicions that these Canadian sport anglers often retain harvested Chinook salmon above the legal limit. For example, a sport angler respondent said:

> Canadians … are really good fishermen. And they do break some laws also. There are incidents of them keeping a few more [Chinook salmon] than they should. And they have been coming here their whole lives, so they are good [at fishing]. Some of them have been fishing since they were kids. (SF01)

And a commercial gillnetter respondent said:

> I know, like, the Canadians, you know, they, they catch all the fish they want, because they cut 'em up while they, as soon as they catch 'em, they cut 'em up and put them in coolers and stuff like that. I've watched them, and we know guys that tell us they did that from up there, and when we go up there we got to pay a real high price for a fishing license. And down here they let them pay the same price as we do and I don't know, it seems unfair anyway to me. (CF01)

Broader than a concern about non-residents' sport fish harvest, study respondents also voiced concern that catching and releasing Chinook salmon in the sport fishery is harmful to the released salmon, and likely results in significant Chinook salmon mortality.

> I think catch-and-release for king salmon … is a big crap. I hear of people catching 20 kings out in Elfin Cove and keeping one. No matter how good they think they are at unhooking things, they are killing fish. (CF16).

Study respondents frequently discussed the Haines King Salmon Derby that usually occurs annually during early June; however, as previously mentioned in this chapter, the derby has been cancelled since 2014. Several respondents expressed concern that the derby added an additional negative effect to the health and abundance of Chilkat River Chinook salmon. For example, a sport angler respondent said: "I don't like [the Haines King Salmon Derby]. I think it is putting added pressure and bringing people in for an event on a fishery that doesn't have enough fish for it" (SF01). Other respondents expressed a view that the Haines King Salmon Derby did not generate any significant negative implications for Chilkat River Chinook salmon because the overall harvests were low (from 50–70 fish), and the majority of the harvest came from Skagway hatchery Chinook salmon, rather than from the Chilkat River wild stock.

4. DISCUSSION

Local Recommendations for Future Management of Chilkat River Chinook Salmon

One objective of this study was to document local perspectives on potentially viable management solutions for improving the sustainability of Chilkat River Chinook salmon. Study respondents identified several factors for future management actions that they considered important to address. Chilkat River Chinook salmon sustainability should be addressed by: 1) protecting and restoring habitat through better management of recreational uses and development around the river, 2) better management of sport and subsistence fishing in the Chilkat River region, and 3) improved management of commercial fishing both regionally and internationally. Continued research is also important to inform viable management decisions. The following sections will detail the general and specific recommendations concerning management made by study respondents.

Discussion of Chilkat River salmon fell into two broad categories: 1) habitat changes—past, present, and future, and 2) multiple fisheries and their direct and indirect effects on salmon stocks. For habitat observations, respondents highlighted local activities such as building roads and bridges or mining but also topics more global in nature, such as climate change or ocean acidification; note, however, that those latter topics will not be covered in this discussion because they are beyond the direct influence of the local communities. For fisheries, respondents conveyed that all Chilkat area salmon fisheries were responsible to some extent for the current status of the Chilkat River Chinook salmon stock. Some of these local understandings of the Chinook salmon decline can be compared to current literature or management actions to look for areas of commonality between users of the resource and the managers. Additionally, such a comparison could highlight areas of potential future research.

Habitat Protection, Restoration, and Enhancement

Respondents viewed Chinook salmon habitat protection and enhancement actions as immediate management priorities. Respondents who identified as subsistence fishers were primarily concerned about commercial river rafting operations on the Chilkat and Klehini rivers. As discussed in Chapter 3, local residents expressed concern that rafting activities harm spawning habitat and egg beds and disturb Chinook salmon when they migrate upriver to spawn. For these reasons, multiple respondents said that Chinook salmon populations would be better protected by eliminating large-scale recreational rafting operations in the Chilkat River watershed. The Haines Assembly and the Takshanuk Watershed Council have also documented their concerns for spawning salmon habitat specifically at popular raft launch sites.[1, 2] There is a dearth of published studies about the habitat effects of river rafting, from launch sites or from other rafting activities such as exiting the raft to navigate shallow water, on Chilkat River habitat and this is a prime subject for future research studies.

Some study respondents also placed a high priority on stopping the proposed development of the Palmer Project, a gold, silver, copper, zinc, and barite mine in the Chilkat River watershed. These respondents said it was important for all Chilkat River salmon that the mine not be allowed to begin commercial operations. The following are respondent comments regarding development of the Palmer Project mine:

1. Berett Wilber, "Assembly Delays Decision on Expanding Raft Guiding on the Chilkat," *KHNS FM*, January 11, 2018, https://khns.org/assembly-delays-decision-on-expanding-raft-guiding-on-the-chilkat (accessed April 2020).
2. Takshanuk Watershed Council. 2018. "Letter Subject: Commercial Rafting Impacts to Chilkat River Fish Habitat," Haines Borough, Assembly Meeting, January 9, 2018, Supporting Documents: "Takshanuk Watershed Council comments re River Access." https://www.hainesalaska.gov/sites/default/files/fileattachments/borough_assembly/meeting/11457/twc_comments_14-mile_river_access.pdf (accessed April 2020).

> … we also have really large issue. … [Installation of the mine] is a major concern … [if they] ever start mining over there on the large scale, that risk, that would put all of our fish and basically our way of life [at risk]. (SUB08)
>
> I don't see an end to commercial fishing in Haines as long as we keep these rivers going in the right way, you know, like keeping the mining—they're trying to start a mine above [Klehini River] and that's the, that's the main spawning river so, I think if a mine goes there I think that's going to end all the fish in the river, and commercial fishing will be just history, too. (CF01)
>
> … my biggest concern for the area is that I think in the next couple years we're looking at the potential for a mine to come in here; the Constantine [North, Inc.] mine up above the headwaters [of the Chilkat and Klehini rivers] where a lot of these salmon go, and I think that there needs to be a real concerted effort to let people know that our food source is heavily, heavily dependent on these waters remaining clear and good. So that is my concern both for the subsistence fishing and for the Haines economy, because the Haines economy is lagging, which means that, you know, something like a mine is going to look really appealing and it's really bad for our subsistence lifestyle. (SUB18)

For study respondents, blocking future mine development is linked with prioritizing protection of salmon habitat in future road building, bridge building, and highway maintenance projects. ADF&G, Department of Transportation (DOT), or local nonprofits should pursue projects that help restore important habitat areas damaged by riverbank erosion and by past development of roads and bridges. Local knowledge regarding salmon habitat protection and restoration is rooted in the long-term experience of observing how habitat has changed, particularly as a result of road development and bridge building around locations such as Big Boulder Creek and the Wells Bridge. As a result, habitat protection and rehabilitation are important measures for improving conditions for the Chilkat River Chinook salmon population. Additionally, "[a Chinook salmon spawning grounds] enhancement program should be initiated to start driving the production numbers up in those spawning areas and in those spawning beds, and let nature carry that on through," urged a commercial fisher respondent (CF13).

Specifically, local knowledge holders recommend streambank stabilization and engineered waterflows as primary measures for achieving Chinook salmon spawning and rearing habitat rehabilitation. These measures can be achieved by engineering logjams inside river flows, enhancing tree cover along severely eroded streambanks, and installing root wads[3] to enhance bank structure over time. The importance of these inriver structures has been well documented in forest stream ecosystems (Murphy et al. 1986; Roni and Quinn 2001) and reinforced by local fishers who engage in different types of fishing in the area. "Little fish like to feed on the riverbanks, in sheltered spots" (SUB09); a sport fisher respondent echoed this idea: "What can be done for habitat restoration [is] placing some log jams in some places that used to have [Chinook salmon fry] and try to get some pools back" (SF01). This observation was echoed further by a commercial respondent: "… [salmon fry] hang out for a year [near their spawning locations] …They need a place to hide. They need corners and eddies to hang in; they don't need to fight the current. They need clear water" (CF12).

Respondents reported that the Takshanuk Watershed Council, the primary local entity dedicated to implementing projects to protect and enhance salmon habitat in the Haines area, has implemented habitat restoration projects in various locations within the Chilkat region, with a focus on installing root wads as a stabilization technique. A commercial fishing respondent explained:

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3. Root wads are a streambank protection technique that provides immediate riverbank stabilization, protects the toe-of-slope, and provides excellent fish habitat, especially for juveniles.*

   * Alaska Department of Fish and Game. n.d. "Streambank Revegetation and Protection: A Guide for Alaska—Protection Techniques: Root Wads," https://www.adfg.alaska.gov/index.cfm?adfg=streambankprotection.rootwad (accessed May 2020).

> Putting more root wads in the main reaches of the [Chilkat] river has the tendency to create a more of a winding river. It is not so fast, and fish can hang out and they can rest on the way up, and the ones that are going out have something to hide under so birds don't get them all. (CF12)

A Klukwan elder described the observed results of these habitat restoration efforts:

> Trees are flowing over the bank, and you can see the little salmon fry, where we're doing bank stabilization. You can walk out on the trees that were laid in there and look down and you can see all kinds of [salmon] fry inside. [It's] a safe haven. When they come up on those small streams next to the banks…they are probably safe there. (SUB08)

For these reasons, study respondents were adamant that all future development in the watershed that affects waterflows in any way should emphasize use of engineered log jams and root wads and avoid the installation of riprap, which respondents concurred has been damaging to the river. Several respondents voiced concern about riprap in the planned replacement of the Wells Bridge. A subsistence fisher respondent discussed the importance of not installing riprap at this location or elsewhere:

> They want to put a new bridge in there at Wells and if they put riprap along there it is going to affect Klukwan in a big way. And, so, we are fighting with them right now. It all has to do with our river. The engineered log jams, they roughen the banks of the river. You have all these logs sitting out and that slows and creates more drag on the current and it creates more habitat for salmon. So, it is much more habitat friendly, and it should last at least 50 years … I wouldn't allow them to put riprap in the river for stabilizing the banks. Because when they did that on the Klehini River it increased the velocity of the river, and increasing the velocity is not conducive of salmon rearing. …When you increase the velocity of the river it eats away the banks … . So our big concern right now is all of this highway work that is going to be going in and their refusal to consider engineered log jams over riprap. (SUB09)

Another habitat restoration measure encouraged by some respondents is increasing wetland areas by rerouting narrow and fast-moving river channels into slower-moving side sloughs, referred to by respondents as "spawning channels." Respondents reported that such measures increase total habitat area and cited previously successful channelization efforts at Big Boulder Creek. In that project, part of the creek was re-routed into an old channel. Prior to re-routing root wads were installed. Studies investigating the effect of past restoration projects and road development projects in the Chilkat watershed should be conducted to better inform future road- and bridge-building decisions.

Past efforts at habitat restoration have also included various attempts to enhance Chinook salmon stock through egg incubation and creation of new egging beds in Big Boulder Creek, but these have been discontinued. Some respondents suggested that these efforts should be revamped, while others believed that engineered egg incubation as well as hatchery fry release attempts were problematic. Local knowledge holders generally disagreed with supplementing or replacing any wild salmon stocks with hatchery-derived stocks. One commercial fisher respondent thought that channelization (for enhancing chum salmon spawning) and "man-made egging beds" were ineffective and a waste of financial resources, and urged that management resources be focused on rehabilitation of existing waterflow areas, stating:

> They're trying to do these sloughs, making these man-made ones, and all that does is feed the bears. They're [not] deep and the bears just wade around and clean them all out. Nothing ever laid eggs in them, because they can't. It's too easy for the bears to clean them out … . They want to put three or four more of them in, what for? It's a waste of money. … Go try to fix the river. Do something to the river. …Make it natural. Don't do this man-made crap. It ain't working. It's just job security. I know that's all it is. Ask any fisherman here and not one of those

> man-made egging beds have done anything because of the bears. It's just wading pools for the bears is all. (CF08)

Fisheries and Fisheries Management

Recent studies in the Chilkat River may inform some respondents' ideas about factors that have contributed to Chinook salmon declines. Respondents generally commented that Chinook salmon are smaller than they used to be and some expressed concern that the fish were returning to spawn at an earlier age. ADF&G has recently conducted escapement studies on Chilkat River Chinook salmon stocks (Chapell and Elliott 2013a; 2013b; Elliott 2018; Elliott and Peterson 2018). Though not an identified study objective for the escapement research projects, researchers are collecting age, size, and length data that could be used as part of a broader dataset to investigate changing size at maturity and age of Chilkat River stocks at their return to fresh water. Other studies in Alaska waters have found a decreasing size at maturity over the past 50 years for sockeye and Chinook salmon stocks (Lewis et al. 2015; Kendall et al. 2014). Potential changes in the size of fish observed by respondents may be a consequence of pressures exerted by numerous fisheries targeting these Chinook salmon runs, which are summarized below.

Management of the Subsistence Fishery

Study respondents from all three user groups suggested that more Chinook salmon are being caught and retained than are reported and that subsistence fishers intentionally target Chinook salmon at times. Calls for improved management of the Chilkat River Chinook salmon subsistence fishery were a persistent theme among commercial fisher respondents, as well as from the sport fishing respondent. Subsistence fisher respondents were less likely to criticize the subsistence fishery, since most respondents believed both that not many Chinook salmon were being harvested and that the statutory priority for subsistence fishing defends the Chinook salmon harvesting that occurs.

As discussed earlier, some of these commercial fishing study respondents believe that the harvest of spawning Chinook salmon in the subsistence fishery is one of the primary threats facing Chilkat River Chinook salmon. These respondents were adamant that there needs to be a conscious effort by local fishers in all the fisheries to protect Chinook salmon; they believed the necessary steps for subsistence fishers included nighttime subsistence closures, a later opening in the season for the subsistence fishery, and only harvesting Chinook salmon under sportfishing regulations. "Protect the resource at all cost … I think we have to do something to protect [Chilkat River Chinook salmon] and stopping people from subsistence fishing [for Chinook salmon] would add something to the stock for sure," said a commercial fisher respondent (CF11). Researchers recorded several specific recommendations for management actions.

First, there was advice for ADF&G to engage in more outreach and education to subsistence fishers about the need to return Chinook salmon to the water. Second, respondents expressed concern about what they perceived to be underreporting of retained Chinook salmon by subsistence fishers. For example, a commercial fisher respondent said:

> Without a doubt there are … in the order of … hundreds of kings that get harvested … as subsistence bycatch … and it's a loophole … I'm not saying that people shouldn't be able to catch a king if they have one in their net that's going to die. … But you and I both know that if you're out gillnetting and you get king salmon in your net, and you like king salmon, people just keep them. They don't get reported … so locally, over time … you're talking about potentially hundreds of fish that [are caught] annually … we should try to account for that number accurately … at least just getting a grasp of that number if nothing else, just trying to get an accurate idea of what that harvest is. Because without knowing what the true harvest is, you don't really know what to do. If it turns out that it's 600, you better do something right away. If it turns out it's 150, maybe just educate the public. At least getting a grasp of what that real number is, that's important, because it's unknown and it could be a lot. (CF11)

To address this perceived problem, respondents recommended active harvest monitoring by managers rather than self-reporting. Active harvest monitoring would consist of inseason creel surveyors who go to fishing sites and interview subsistence fishers about their Chinook salmon harvest amounts. Research in other communities in Southeast Alaska has shown that harvests reported through the subsistence permit system can substantially underestimate the actual harvest (Walker 2009). Tables 3-1 and 3-2 support a need for more research into subsistence harvest reporting processes and recommendations for improvement.

As discussed above, some respondents reported that Chinook salmon are more active during the nighttime and that some subsistence fishers purposefully target them during overnight fishing periods. Therefore, a third recommendation presented by respondents to improve escapement was to close subsistence fishing in the Chilkat Inlet at night, beginning at midnight and reopening the following morning.

The fourth management recommendation for the subsistence fishery was to delay the opening of the subsistence sockeye fishery until mid-June in order to let the majority of Chinook salmon pass before nets go in the water. Several study respondents commented that an early opening to the subsistence fishery (prior to June 15) is unnecessary for meeting sockeye salmon subsistence needs. The following comments reflect the reasoning for this recommendation:

> Then the first two weeks of June are hot [for catching Chinook salmon] … It seems like it is a little too early on the [subsistence] opening that close to the river mouth … they must be catching a lot of kings because it is right at the same time [Chinook salmon] really start pouring into the [Chilkat] river. … Maybe [subsistence fishers] should wait two more weeks, because the sockeye run a long time. (SF01)

> The subsistence fishery opens while those king salmon are still available and they ought to move either the date or the line and get those gillnets off those early king salmon, because this run does seem to be in danger … [subsistence fishers are] supposed to be looking for sockeye. (CF06)

> I would make sure there is no subsistence fishing to below North Sullivan [Island] until June 15 until the kings pass. (CF15)

In addition to these potential closures of the early subsistence sockeye season, respondents suggested that a regulation to reduce net mesh size could also potentially lead to improved Chinook salmon escapement.

In contrast to commercial respondents' concerns about subsistence harvests of Chinook salmon, subsistence respondents believe that retention of Chinook salmon in the subsistence fishery is low in number and creates little adversity to the population. One subsistence fisherman talked about his experience catching Chinook salmon in his subsistence net:

> The only time we catch king salmon is on the Klukwan side, nobody ever fishes on the Klukwan side. Last year I cut up a lot of my nets trying to save king salmon rather than ruining their gills because they had eggs in them. I don't need that many kings anyway. (SUB12)

At the same time, what Chinook salmon are harvested are important to the residents of Klukwan. As one subsistence fisher noted:

> Ourselves don't work with … nothing but sockeyes. I don't. If I get, any king salmon I get, now I throw back if they are alive … and if they are dead, I pretty much give them away. (SUB06)

Another respondent echoed this sentiment:

> But more I read Fish and Game said that only 3% of the fish is caught by subsistence people. And up in Klukwan, maybe, 10 or 15 of us doing subsistence. But if we miss out it hurts us, Klukwan fishermen [and] subsistence users. (SUB07)

Subsistence fisher respondents cited state and federal subsistence priority laws and suggested that the effects of both commercial and sport fisheries need to be better understood and restricted prior to any additional

restrictions on subsistence fishing. For example, a subsistence fisher said: "Commercial fishermen before us should be cut [off]. Instead of that, they cut down subsistence first. It's backward from the [subsistence] law" (SUB07).

ADF&G management actions over the years following this study indicate concern for the effects of subsistence harvests of Chilkat Chinook salmon. ADF&G seeks a balance between conservative management of the local Chinook salmon stock while still allowing enough opportunity near to fishers' communities to harvest enough sockeye salmon to meet their subsistence needs. In recent years, the inriver subsistence fishery season has been reduced to close subsistence fishing when Chinook salmon are migrating while the marine subsistence fishery has been delayed from starting well into July. In response to concerns about incidental harvest in the subsistence fishery significantly affecting the Chinook salmon population, starting in 2017 ADF&G required subsistence fishers to release live Chinook salmon caught in their nets (Lum and Fair 2018:15).

Subsistence fishers who wish to harvest a limited number of Chinook salmon can do so legally under sport fishing regulations. In accordance with 5 AAC 47.055, in response to winter troll fishery catch per unit effort, an emergency order designates the season's sport fish bag and possession limits and length restrictions, which are subject to further inseason management by emergency order for conservation purposes. Some respondents thought that harvesting Chinook salmon by rod and reel encourages harvest in limited numbers without the risk of large numbers of spawners being caught and damaged in gillnets. "I am okay with a one-fish limit. That is fine. [Chinook salmon] are big fish," explained a sport fisher respondent (SF01). Selective harvest of Chinook salmon is a traditional practice among subsistence fishers in the Chilkat River using a gaff or spear but those gear types have not been allowed for decades (Mills et al. 1984:22–23; Turek 2009:8–9). One subsistence fisher respondent wondered why gaffs could not be used, when the effect of gaff harvests on the stock was negligible, especially in comparison to the commercial fisheries and recreational use of the river: "That's big things. When, seems so minimum where they took our gaff hook" (SUB06). There are significant differences between the use of a gaff or spear and rod and reel to selectively harvest fish, including: the requirement of obtaining a sport fishing license, the principle that the harvest is not done for "sport," and the lack of regulations allowing the use of rod and reel for Chinook salmon in the Chilkat River. Marine fishing for Chinook salmon with rod and reel is allowed under sport fishing regulations, but in addition to the above-listed problems, this scenario adds the requirement of a boat and travel to salt water.

Management of the Commercial Fishery

Respondents encouraged closer monitoring and more conservative management of the commercial fisheries. Study respondents expressed a general concern about Chinook salmon bycatch occurring in all the commercial fisheries, asserting that the level of mortality and subsequent waste of incidentally harvested salmon is unacceptably high. Additionally, respondents called for both more accurate reporting and stricter enforcement of commercial Chinook salmon incidental harvests. Incidental harvests in the commercial trawl fishery represented the greatest concern for local fishers, although respondents also considered the trawl fishery to be the most difficult commercial fishery to monitor and regulate. Study respondents viewed any future regulation of the commercial trawl industry as unlikely given the high level of economic and political power wielded by the industry.

Commercial fisher respondents believed that the regional purse seine commercial fishery also has too much political influence over management decisions. Specifically, respondents were concerned that commercial seine operators are being granted salmon catch allocations that are too high.

> The seiners are pretty powerful. They are too strong for us to deal with politically. They can get what they want. The system is set up in such a way that they have allocation and I guess they can get in there because of those allocations. (CF02)

Respondents opined strongly that seine allocations and open fishing periods need to be more carefully managed because of the likelihood that seiners are intercepting significant numbers of Chinook salmon heading for the Chilkat River, especially in the expanses of Icy Strait and Chatham Strait. "[Seiners] should

be pulling it back and letting those fish get past those areas [into Lynn Canal] and closer to their homes," said a commercial fisher respondent (CF03).

Commercial fishing respondents said that the timing of the local drift gillnet commercial fishery is structured to allow for the passage of adequate numbers of Chilkat River Chinook salmon. A commercial fisher respondent explained:

> Here in the Chilkat Valley, where we have a king salmon run in the Chilkat River, we have a management plan that keeps the gillnet fleet back at Seduction Point and gives king salmon a breathing area if they are still mulling around in June, because we don't start [gillnetting] until the third Sunday in June and most of the [Chinook salmon] have already moved up into the inlet. So maybe by July fourth or something we [commercial gillnetters] are moving in [up Chilkat Inlet] a little bit, if there are fish [sockeye salmon present]. Sockeyes are what we are targeting, and by then the king salmon have moved into the river. I like to think it works pretty well as far as that goes with the [local drift gillnet] commercial fishery. (CF12)

Despite these regulatory measures, other commercial fishing respondents still recognized the potential effect of the commercial gillnet fishery on local salmon stocks:

> [Managers need to] be very, very careful about allowing [commercial fishing] early on in the gillnet season when there's sockeye opportunity. I wouldn't allow effort up inside of the inlet … the other thing is we know there's a lot of king salmon still mowing around that time of year in June up by the river—even in July. So even if it's only one or two boats, they can really affect a lot of king salmon, and the point is let's just keep them [commercial boats] out of there and let the fish get up. (CF09)

Most of the commercial fishing respondents were confident about the sustainability of the current management of the local drift gillnet commercial fishery. At the same time, they were adamant that ADF&G continue to monitor the timing of the fishery and of the Chinook salmon runs, and shift the management strategy if warranted. Most of the commercial fishing respondents expressed that concerns for Chinook salmon health resulting from commercial fishing activity pertained to other commercial fisheries rather than the local drift gillnet fishery.

However, in contrast to many respondents' belief that the commercial gillnet fishery has a negligible influence on Chilkat River salmon stocks, ADF&G stock assessment research on Chilkat River Chinook salmon suggests harvests from this fishery may be substantial. ADF&G's coded wire tag (CWT) program has contributed information (periodically since 1985 and consistently since 2000) about smolt abundance, marine harvest in mixed-stock fisheries, and marine survival from smolt to adult life phases (Elliott and Peterson 2018). CWT studies indicate that Chilkat River Chinook salmon rear primarily in the inside marine waters of northern Southeast Alaska, as some respondents indicated; that is, they mostly stay within Southeast Alaska waters and are therefore vulnerable mostly to harvesting by Southeast Alaska fisheries as immature fish as well as during their return spawning migrations (Heinl et al. 2014). Through tagging studies, ADF&G has researched where Chilkat River Chinook salmon are caught, though results from recent research are not currently available. During the most recent study period for which data are available, most harvests of Chilkat River Chinook salmon occurred in northern and central Southeast Alaska. ADF&G conducted CWT studies on the 1991 brood year of Chilkat River Chinook salmon and identified the percentage of the harvest of these fish from the following fisheries: the recreational fishery in Haines, Juneau, and Upper Cook Inlet composed the largest percentage of the harvest at 33%; the District 115 (Lynn Canal) and District 111 (near the Taku River) gillnet fishery accounted for 26%; the Southeast troll fisheries added another 24%; the District 112 and District 114 seine fisheries made up 9%; and subsistence harvests accounted for the remaining 7% (Ericksen 1999).

Since 2014, ADF&G, through its discretionary authority, has implemented changes to regulations made by the Board of Fisheries to marine commercial fisheries, reflecting its concern for the incidental harvest of Chinook salmon. In 2018, the Board of Fisheries designated the Chilkat River Chinook salmon stock as a stock of management concern and approved ADF&G's action plan for managing the stock (Lum and Fair 2018). For the gillnet fleet, ADF&G implemented reductions in fishing areas and allowable times as well as reduced mesh sizes. These reductions in time and area exceeded the time and area conservation measures prescribed in the *Lynn Canal and Chilkat River Chinook Salmon Management Plan* (5 AAC 33.384) and also coincide with commercial fisheries respondents' exhortations to delay the fishery until Chinook salmon have mostly passed. In the purse seine fisheries, retention of Chinook salmon has been prohibited. In the driftnet fisheries in District 15, night closures have been implemented since 2017, reflecting respondents' observations that Chinook salmon are more likely to be harvested at night than during the day (Lum and Fair 2018:9).[4] The troll fleet has been subject to time and area closures since 2017.

A 1991 study that compared logbook-recorded catch rates to fish ticket-reported catches also supported local concerns that the incidental harvest of Chinook salmon is greater than what is reported (Ericksen and Marshall 1997). This 1991 study showed that the Chinook salmon harvest was underreported in the Lynn Canal commercial drift gillnet fishery, so estimated rates are most likely low. Additional studies attempting to quantify underreporting rates and amounts are warranted.

Respondents expressed apprehension about the negative effect trawlers have on local Chinook salmon stocks through incidental harvest. However, CWT studies have not found Chilkat River Chinook salmon in sampled Gulf of Alaska trawl catches. In the trawl fisheries in the Gulf of Alaska, Chinook salmon are most frequently harvested incidentally in the central and western regulatory areas, which is far beyond the inside-rearing waters of Chilkat River Chinook salmon. Guthrie et al. (2012) noted that the 2010 Bering Sea trawl fisheries estimated approximately 19% of the incidental harvest in the trawl fisheries was from Southeast Alaska stocks, but did not detail the harvest on a river-specific level. There are 34 systems in Southeast Alaska that produce Chinook salmon, including large systems such as the Taku and Stikine rivers, which have Chinook salmon that rear in outside marine waters and are more vulnerable to harvest in these trawl fisheries.

Management of the Sport Fishery

Limiting harvests under sport fishing regulations was also paramount for most study respondents. For example, study respondents identified the annual Haines King Salmon Derby event as unsustainable because of the number of Chinook salmon that are caught. For this reason, multiple respondents urged that the event, and other regional Chinook salmon derbies, be discontinued. Some respondents felt that allowable Chinook salmon sport harvests should be no higher than one Chinook salmon per person per day and that any other Chinook salmon caught should be immediately released. A commercial fisher respondent said that managers need to maintain a sport harvest limit of "only one per day of king salmon … Who needs more than that anyway? You can go out the next day and get another one. You can go out five days a week.

4. Alaska Department of Fish and Game Division of Commercial Fisheries, "Southeast Alaska Purse Seine and Drift Gillnet Fisheries Chinook Salmon Management Restrictions," news release, April 3, 2018. http://www.adfg.alaska.gov/static/applications/dcfnewsrelease/899583083.pdf (accessed October 2021).
   Alaska Department of Fish and Game Division of Commercial Fisheries, "Southeast Alaska Chinook Salmon Management Restrictions for Troll, Purse Seine, and Drift Gillnet Fisheries," news release, April 1, 2019. http://www.adfg.alaska.gov/static/applications/dcfnewsrelease/1020850172.pdf (accessed October 2021).
   Alaska Department of Fish and Game Division of Commercial Fisheries, "Southeast Alaska Chinook Salmon Management Restrictions for Troll, Purse Seine, and Drift Gillnet Fisheries," advisory announcement, February 11, 2020. http://www.adfg.alaska.gov/static/applications/dcfnewsrelease/1133815060.pdf (accessed October 2021).
   Alaska Department of Fish and Game Division of Commercial Fisheries, "Southeast Alaska Chinook Salmon Management Restrictions for Troll, Purse Seine, and Drift Gillnet Fisheries," advisory announcement, February 8, 2021. http://www.adfg.alaska.gov/static/applications/dcfnewsrelease/1242554703.pdf (accessed October 2021).

I mean, why do you need more than one a day?" (CF08). Another commercial fisher respondent echoed that thought:

> Because once [the Chilkat River Chinook salmon] have made it up [into Chilkat Inlet] they have pretty much ran the gauntlet. They give them every chance to get up the river when they can and still let everybody fish for one … if you go out and catch a king salmon you are happy. If you have four guys in your boat and they all catch one, I don't know why you wouldn't be happy. Like, why do you need to keep fishing and try to catch eight? (CF16)

Some respondents suggested that managers should even consider reducing the Chinook salmon sport harvest limit to one per week per person, or less. "I think [harvesting] two [Chinook salmon per person] annually is enough" (CF11).

The Haines King Salmon Derby event has been cancelled since 2014 out of concerns for the Chinook salmon stock. On the regulatory side, ADF&G has undertaken conservative management measures through emergency orders since 2012 (Lum and Fair 2018:12–14).[5] These actions have included reduced bag and possession limits, time and area restrictions, the non-retention of Chinook salmon, and closed areas. Respondents' concerns with Canadian fishermen harvesting too many salmon under state sport fishing regulations have not been addressed outside of these regulatory actions.

Escapement Goals and Future Research

Study respondents agreed that a viable overall management strategy for Chilkat River Chinook salmon should be based on sound research and the careful management of sport, subsistence, and commercial fisheries to reach the defined biological escapement goal (BEG).[6] A commercial fisheries respondent explained that recently the BEG has not been met for Chilkat River Chinook salmon due to declining overall returns:

> [It] was probably about 12 years ago when Fish and Game finally came up with [a biological escapement goal]. We didn't have one before and the range was 1,800 to 4,000 [Chinook salmon]. … And it ran by the Fish and Game advisory committee and we worked out a management plan around this BEG. But in the last few years we have had a lower range of that … they haven't been showing up. (CF12)

Some study respondents were adamant that Chilkat River Chinook salmon returns should be managed for maximum escapement, rather than minimum escapement. Another commercial fisher respondent said:

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5. Alaska Department of Fish and Game Division of Sport Fish, "Emergency Order No. 1-KS-R-02-18," emergency order, April 1, 2018. https://www.adfg.alaska.gov/Static-sf/EONR/PDFs/2018/R1/1-KS-R-02-181.pdf (accessed October 2021).
   Alaska Department of Fish and Game Division of Sport Fish, "Emergency Order No. 1-KS-R-03-19," emergency order, April 1, 2019. https://www.adfg.alaska.gov/Static-sf/EONR/PDFs/2019/R1/03.0_EO_%2001-KS-R-3.0-19(F)3.pdf (accessed October 2021).
   Alaska Department of Fish and Game Division of Sport Fish, "Emergency Order No. 1-KS-R-06-20," emergency order, February 12, 2020. https://www.adfg.alaska.gov/Static-sf/EONR/PDFs/2020/R1/06.0_EO-01-KS-R-6.0-20(F)%20Wild%20KS%20(002)1.pdf (accessed October 2021).
   Alaska Department of Fish and Game Division of Sport Fish, "Emergency Order No. 1-KS-R-22-21," emergency order, August 1, 2021. https://www.adfg.alaska.gov/Static-sf/EONR/PDFs/2021/R1/22.00_EO-01-KS-R-22.00-21(F)2.pdf (accessed October 2021).
6. In 2003, the department adopted an escapement goal range of 1,750–3,500 large Chinook salmon for the Chilkat River drainage, and an in-river run goal range of 1,850–3,600 large Chinook salmon upstream of the adult marking area (Heinl et al. 2017). Escapement estimates are based on a mark-recapture program in place since 1991. Between 1991 and 2017, the lower end of the escapement goal was met in all but six years. Five of the years during which it fell below the lower bound have occurred since 2012.

> Instead of saying "minimum escapement is OK," which I feel like that's what they're doing, is saying "OK as long as we reach minimum escapement that's alright," [local fishers are] saying "no, we want to target maximum escapement." That's what we want as fishermen, manage us accordingly. (CF03)

Critical study respondents blame the political power of the commercial seine industry for driving management actions. A commercial fisher respondent explained:

> Now they manage the [Chilkat River Chinook salmon] run by these minimum escapement goals [and] they are too low because they … open the fishery up to [commercial seiner] groups south of us that can intercept our fish and cut them off. So that doesn't necessarily mean that we are going to get the rest of the fish that we need up there to get the minimum escapement. (CF02)

Elder respondents from Klukwan explained that the Tlingit have been managing the Chilkat River salmon fisheries to maintain healthy spawning escapement for generations and urged that these traditional principles should continue to be applied into the future. A Klukwan elder said:

> We would honor their [the salmon's] return by allowing them to go, to go [to] their homeland without us preventing them from going there. We would acknowledge them for coming back. We would thank them. So we wouldn't go right on out there and hoard more. There would be a time when we [are] gonna go out and catch all fish as possible as we can. But basically they [the elders] would let escapement take place so that the salmon can reproduce. (SUB01)

Klukwan elders interviewed for this study reported that traditionally the Tlingit had knowledgeable persons who enacted traditional management for the group, with a primary purpose to make sure that sustainable spawning escapement occurred. A Klukwan elder explained:

> When he knew it is the time for fish to come upriver, he would tell some of the young men go down to 6 Mile, 12 Mile, 18 Mile and the [Chilkat] lake. He controlled it. … [The men] looked for salmon. If there were salmon they would come up and tell the chief … the chief was saying, "*Gook*, *gook*; go ahead, go open" … but don't take more than you need. Take enough for yourself and take enough to share with others. That was always important for somebody like us, something to share with others. … And I tell this to Fish and Game; "Only one elder controlled the whole river. And you folks have a full house of Fish and Game people and still cannot control it." (SUB07)

Overall, respondents to this study agreed that the local priority should be ensuring that enough Chinook salmon are able to travel up the Chilkat River and its tributaries each year to spawn, and that all user groups need to be restricted in order to allow for maximum Chinook salmon escapement. To this end, a commercial fisher respondent said that all the user groups need to make sacrifices for the time being in order to ensure adequate spawning escapement of Chilkat River Chinook salmon:

> At the regional level [we all need to] quit intercepting them … let's quit catching them where we think they're coming in and let them get to the terminal areas … let's just ease up on fishing them, try and get rid of anything that's catching them. Because I do feel like that run's in some serious trouble. (CF03)

Commercial fisher study respondents recommended ongoing scientific research on several topics: healthy Chilkat River Chinook salmon spawning escapement levels; improved management of regional fisheries for the benefit of the Chilkat River Chinook salmon population; global ocean health; and Chinook salmon food webs. Specific recommendations for further study included:

1. Establishment of a genetic baseline for Chilkat River Chinook salmon.

2. Radiotelemetry tagging and genetic sampling of Chinook salmon populations across Southeast Alaska. The goal of this research would be to understand migratory patterns and to identify harvest locations of Chilkat River Chinook salmon, especially in the commercial trawl fisheries.
3. Research to better understand the population health of the food resources salmon rely on while living in salt water. The goal of this line of inquiry would be to determine whether changes in food availability are negatively affecting the Chilkat River Chinook salmon population.

> The big picture needs to go towards the whole sustainability … the shellfish population and salmon populations they all have to work together. Our present management system is kind of going that way, but I don't think it's there yet. (CF13)

4. Investigations into larger ongoing issues affecting global ocean health.

> If it is an ocean health issue, no matter what we do in our spawning areas it won't help. It will be a step-by-step project to find out. (CF13)

Since 2014, ADF&G has begun several research projects, the results of which, when completed, should further inform many of these questions and concerns posed by the respondents about Chinook salmon escapement, migration, and future research needs. These projects include mark-recapture studies to investigate inriver Chinook salmon abundance, age, and sex composition (Elliott 2018); and a coded wire tagging project to provide estimates of smolt abundance and marine harvest of Chinook salmon (Elliott and Peterson 2018). Past studies have investigated the food habits of juvenile Chinook salmon in Southeast Alaska (e.g., Weitkamp and Sturdevant [2008]), but studies specific to Chilkat River Chinook salmon or more current studies could be beneficial.

A 21st Century Approach: The Need for Cooperation Among Stakeholders and the Need for Scaling Back Fisheries Effects

Several study respondents urged that the current century is a time where stakeholders need to consider stepping back and attempting to view future fisheries management from the lens of long-term sustainability. These respondents discussed issues such as climate change, overfishing, and the overall pressure placed on ocean and riverine resources. Study respondents recommended that all user groups scale back the intensity of their demands on Chilkat River Chinook salmon, and on salmon in general. Respondents urged all stakeholders to unite in cooperative efforts toward long-term sustainability above all else. The following comments elaborate on this holistic, sustainability-minded, local knowledge perspective. A commercial fisher respondent said:

> I'm not sure you can quote me on this because I'd probably get shot in the middle of the night and they'd throw me overboard, but I wish we could all band together as gillnet fishermen and go back to the fish wheel days or the fish camp days, or these fishing practices that are very targeted and very good, get back to that so that we are fishing in a terminal area, where we can very closely monitor and control and limit the amount of fish we're catching. Get rid of all of our boats, get rid of all of that fuel that we're burning, get rid of, I know … the lifestyle, and I love the lifestyle. I chose it for a reason but I just feel like for the future of our stock I wish we could just get rid of our boats and collaborate with a permit and do some cooperative effort which would target at the terminal areas the fish we want to catch. … We don't want to catch more than that because we want to look out for the future. We want a sustainable stock. We want to maintain those sustainable stock numbers, but I just feel like you could have so much more control and you'd make just as much money. I mean because you're still going to catch you know, all these fish, but you're just going to do it in such a better way, a more controlled,

> more scientific way. That's what I wish we could do. … It's going to take some collaborative, compromising efforts on a lot of parts … politically [and] biologically … we just need to really be managing our stocks with the sustainability word being the priority … not whether anybody's going to make money, not whether anybody is going to keep their job, but let's protect the resource at all costs. (CF03)

And another commercial fisher respondent said:

> ... Another thing is getting managers connected to fishermen. Let's stop viewing Fish and Game as the enemy … foster a relationship so that the department doesn't have to be so defensive about everything. … And the thing that makes me really amazed is that if you look back, no one is changing their behavior … none of the groups are changing their behavior. The managers still manage. The fishermen still fish as hard as ever and get every fish they can get. Subsistence people still maintain that they can go down every minute and get every fish they get, and no one changes their behavior. We all recognize that there is a big issue, but no one can really do anything if we don't change and at some point, we're all going to have to get together and agree on some things and work together. That's the only way it's going to happen. … If we're all going to make adjustments, it's going to be pretty hard to delineate which user group has rights over this other user group and … unless we can change our mindset to not be thinking about the user groups and just to be thinking about the resource, that's really what it comes down to. We need to be resource minded, not user group minded … that's just the way you approach it … [not] which user groups should get less of the resource. It's not the user groups, it's the resource! (CF09)

Conclusion

This project documented local knowledge about Chilkat River Chinook salmon stocks. It illustrates the knowledge held by local commercial and subsistence fishers about all aspects of Chinook salmon in the past and present, considers how this knowledge compares to what managers and biologists know, and discusses potential solutions.

Key respondent interviews conducted with Haines and Klukwan residents highlighted the integral role of salmon in the lives and livelihoods of the region's residents. Respondents interviewed over the course of the project demonstrated their extensive knowledge of salmon. Generally, there was overlap in what respondents know and believe is affecting salmon stocks in the Chilkat River and what managers, biologists, and other scientists believe is occurring. No clear consensus emerged from the interviews about what should be done to improve the Chinook salmon run, but many respondents offered suggestions and avenues of further research.

Participants in each fishery have specific knowledge and insights; fostering better communication among the user groups could increase sharing of this knowledge and an opportunity for each to learn from the other. Fisheries managers need to be involved in these conversations, as well, but also other decision-makers at local and state levels since these discussions pertain to area resource developments. Chilkat River salmon must traverse a gauntlet of fisheries over the course of their lifetimes. Different respondents placed the primary blame for the Chilkat River Chinook salmon decline on specific fisheries, but almost all agreed that the situation is complex and results from a combination of factors. A sport angler respondent best summarized the general view garnered from this study:

> But overall, it is kind of a holistic issue here with all of the different variables involved with just growing amounts of human activity. I think it is everything. I don't think it is just subsistence fishing. I think that is a small part of it. I think it is some habitat loss from logging in previous years causing siltation and probably some natural things like rebound. You know things are changing. And sport fishing doesn't help. Commercial fishing definitely has mortality there. Trawling out in

> the ocean is having an effect on them [Chinook salmon]. And probably just natural things in the ocean—natural survival in the ocean. Supposedly, Chilkat kings live in the inside waters most of their lives, so that could be a problem, too. Most fisheries in the world aren't getting better and it is rare that this is as good as it is [here]. In the world this is a rare thing … . [We still have] five species of salmon here so it is still pretty good. (SF01)

Even so, local observations indicated that Chilkat River Chinook salmon abundance has largely declined, that fish are smaller, that very few Chinook salmon return to tributaries such as Big Boulder and Little Boulder creeks to spawn, and that some formerly abundant Chinook salmon spawning areas no longer have any fish returning. These are serious issues for local residents in the study communities. "I don't know how you keep up with this, as far as stable systems for fish to grow in," noted one commercial gillnetter respondent (CF06).

Recommendations

During the in-depth interviews about Chilkat River Chinook salmon, several recommendations were made concerning management of the fisheries, and avenues of potential research were also highlighted. Research and monitoring have begun on some of these topics since the time of the interviews.

Fisheries Management

- Improve communications and discussion between residents of the study communities and ADF&G about what ADF&G knows or believes and about management actions.
- Through management measures, reduce incidental harvest of Chinook salmon in all fisheries.
- Improved reporting of incidental harvest in the commercial fisheries through the existing fish ticket program.
- Improved reporting of incidental harvest in the subsistence fisheries through the subsistence fisheries permit program or through active harvest monitoring by ADF&G.
- Allow the use of gaffs for selective subsistence harvest.
- Implement night closures for the subsistence fishery.
- Minimize effects of the sport fishery, especially by non-resident participants.
- Periodically assess escapement goals to ensure those are still robust.

Environmental Studies

- Document changes in the river channel and its tributaries.
- Monitor the silt load.
- Map spawning beds, past and present.
- Install additional river gauges to monitor water flows.
- Document changes to snowpack and investigate its long-term effect on salmon runs.
- Engage in habitat restoration through installation of log jams or other engineered habitat.
- Investigate the effects of jet boat and raft tours on important salmon habitat.
- Monitor marine water temperatures.

Biological Studies

- Investigate long-term trends in the age of returning mature salmon.
- Engage in salmon prey and predator resource studies.

- Document long-term changes in ocean survival of salmon.
- Conduct radio telemetry studies and additional genetic sampling to understand migratory patterns and further identify where Chilkat River Chinook salmon are being caught.

ACKNOWLEDGMENTS

The Division of Subsistence is grateful to all the key respondents in Klukwan and Haines who agreed to participate in this study and provided such rich local and traditional knowledge of Chilkat River Chinook salmon. Researchers would also like to thank the Chilkat Indian Village for input and guidance in making this project possible.

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APPENDIX A: PROJECT SUPPORT LETTERS

CHILKAT INDIAN VILLAGE
"Yee gu.aa yax x'wan."

An Indian Reorganization Act Village
Under Act of Congress June 15th, 1935
32 Chilkat Ave. Klukwan, Alaska 99827
HC60 Box 2207 Haines, Alaska 99827
Phone: 907-767-5505
Fax: 907-767-5518
klukwan@chilkat-nsn.gov

Meredith Marchioni
Subsistence Resource Specialist III
Division of Subsistence
AK Department of Fish and Game
333 Raspberry Road
Anchorage, AK 99518-1599
April 23, 2012

RE: Alaska Sustainable Salmon Fund: Harvest Trends in the Chilkat Chinook Salmon Fishery

Dear Dr. Marchioni,

The Chilkat Indian Village Tribal Council has agreed to participate in the proposed subsistence research project that the Division of Subsistence of the Alaska Department of Fish and Game would like to begin in the fall of 2012. The proposed research illustrating current and traditional subsistence fishing practices in the village of Klukwan would be of benefit to the community, especially as changes in demography, technology, ecology and other cultural, social and economic factors continue to place competing demands on the finite resources and the Tlingit way of life.

As we understand the goal of the proposed study, it will provide an analysis of historic and contemporary subsistence salmon harvests by residents of Klukwan and a description of the human and ecological variables affecting these subsistence fisheries. The Chilkat Indian Village can assist in the interview and participant observation process to be conducted with community residents. The villages' participation will improve participant receptivity to the sharing of information regarding their subsistence harvest of Chinook salmon, harvest and use areas, and resource ecology observations.

The Chilkat Indian Village is prepared to assist the project be successful by providing input into traditional fishing practices, as well as locating and coordinating local researchers to help throughout the duration of the project.

Sincerely,

John Brower
Tribal Administrator

CHILKAT INDIAN VILLAGE
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klukwan@chilkat-nsn.gov

Division of Subsistence
AK Department of Fish and Game
333 Raspberry Road
Anchorage, AK 99518-1599
April 23, 2012

RE: Alaska Sustainable Salmon Fund: Northern Tlingit Salmon Fishing

Dear Dr. Langdon and Dr. Marchioni,

The Chilkat Indian Village Tribal Council has agreed to participate in the proposed subsistence research project that the Division of Subsistence of the Alaska Department of Fish and Game would like to begin in the fall of 2012. The proposed research illustrating current and traditional subsistence fishing practices in the village of Klukwan would be of benefit to the community.

As we understand the goal of the proposed study, it will provide an analysis of historic and contemporary subsistence salmon harvests by residents of Klukwan and a description of the human and ecological variables affecting these subsistence fisheries. The Chilkat Indian Village can assist in the interview and participant observation process to be conducted with community residents. The villages' participation will improve participant receptivity to the sharing of information regarding their subsistence harvest of Chinook salmon, harvest and use areas, and resource ecology observations.

The Chilkat Indian Village is prepared to assist the project be successful by providing input into traditional fishing practices, as well as locating and coordinating local researchers to help throughout the duration of the project.

Sincerely,

John Brower
Tribal Administrator

APPENDIX B: KEY RESPONDENT INTERVIEW PROTOCOLS

Name: _____ In what year were you born? _____

1. How many years have you lived in the Haines/Klukwan area? _____
2. How many years (nonconsecutively) have you been commercial fishing for salmon in the upper Lynn Canal?
3. What commercial fishing permits do you own or have you owned in the past and where have you fished them?
4. Why did you choose to become a commercial fisher out of Haines, Alaska?
5. Why do you continue to commercial fish out of Haines, Alaska (do you enjoy it)?
6. Would you ever stop commercial fishing?
7. What would you do if you weren't commercial fishing?
8. What is your first memory as a commercial fisher?
9. What is your favorite memory commercial fishing in the upper Lynn Canal?
10. Can you recall any years commercial fishing that were significant for any reason?
11. Can you recall the locations and years you harvested the largest number of salmon (any species or all species?)?
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12. Have you seen any changes in the marine and freshwater environment where you fish, either in the Lynn Canal or the Chilkat River (i.e. water temperature, weather patterns, air temperature, etc.)?
    i. Over what period of time have you noticed these changes?
    ii. Do you believe there are connections between these environmental changes and the Chinook salmon?
13. What observations have you made regarding Chinook salmon during your time as a commercial fisher in the upper Lynn Canal?

a. Have you noticed any changes in the behavior of Chinook salmon during your time as a commercial fisher? (i.e. is where they get caught in the net changing, is their behavior changing under different climactic conditions, etc.)?

b. Have you seen changes in the appearance of Chinook salmon during your time as a commercial fisher? (i.e. are they changing in size, color, etc.)?

c. Have you made any observations regarding other species in the upper Lynn Canal and/or the Chilkat River?

    a. Do you believe there is any connection between the changes in these species and the Chinook salmon?

14. What knowledge has been passed down to you regarding the Chilkat Chinook salmon run, the environment, and the other species in the Lynn Canal?

    a. Who did you acquire this knowledge from?

15. Do you believe there has been a decline in the Chilkat Chinook salmon run?

    a. If so, what do you believe to be the cause of the decline?

    b. Do you ever take kings home for home pack? How many do you like to have for a season and have you been getting your target number in recent years?

16. What do you think the managers and biologists believe is happening with the Chinook salmon stocks?

17. What do you believe should be done to preserve and/or rebuild the Chilkat Chinook salmon stocks (in terms of both management and biology)?

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18. Have you ever commercial fished for crab in the Upper Lynn Canal?

19. Have you ever subsistence fished for crab in the Upper Lynn Canal?

20. How do you feel about the crab population in the area?

REGULATIONS AND POLITICS:

- How have you been involved in regulatory changes?
- Are you involved in the fish and game advisory committee?

COMMUNITY AND COMMERCIAL FISHING

- Has there been a change in the number of individuals participating in the gillnet fishery in your community?
- Has there been a decline in the number of active boats and permits in the commercial fishery?
- If there has been a decline in the fishery what do you attribute to the decline?

COMMUNITY

- Do you think that commercial fishing continues to be a large part of the life here in Haines?
- Do you foresee commercial fishing to be a part of the future of Haines?
- Why do you continue to live in Haines?

Name: _____ In what year were you born? _____

1. How many years have you lived in the Haines/Klukwan area? _____
2. How many years (nonconsecutively) have you been subsistence fishing for Chilkat salmon?
3. When and why did you start subsistence fishing for salmon in Haines (if has always fished since childhood then what age did they start participating)?
    a. Who taught you how to subsistence fish?
4. Why do you continue to subsistence fish for salmon in Haines (do you enjoy it)?
5. Would you ever stop subsistence fishing?
6. What would change if you didn't subsistence fish for salmon?
7. What is your first memory as a subsistence fisher?
8. What is your favorite memory subsistence fishing in the Chilkat River or Upper Lynn Canal?
9. Can you recall any years subsistence fishing that were significant for any reason?
10. Can you recall the locations and years you harvested (or just experienced) the largest number of salmon (any particular species or all species)?
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11. Have you seen any changes in the marine and freshwater environment where you fish, either in the Lynn Canal or the Chilkat River (i.e. water temperature, weather patterns, air temperature, etc.)?
    i. Over what period of time have you noticed these changes?
    ii. Do you believe there are connections between these environmental changes and the Chilkat Chinook salmon?
12. What observations have you made regarding Chinook salmon during your time as a subsistence fisher in the Chilkat River?

a. Have you noticed any changes in the behavior of Chinook salmon during your time as a subsistence fisher? (i.e. is where they get caught in the net changing, is their behavior changing under different climactic conditions, etc.)?

b. Have you seen changes in the appearance of Chinook salmon during your time as a subsistence fisher? (i.e. are they changing in size, color, etc.)?

c. Have you made any observations regarding other species in the upper Lynn Canal and/or the Chilkat River?

    a. Do you believe there is any connection between the changes in these species and the Chinook salmon?

13. What knowledge has been passed down to you regarding the Chilkat Chinook salmon run, the environment, and the other species in the Lynn Canal?

    a. Who did you acquire this knowledge from?

14. Do you believe there has been a decline in the Chilkat Chinook salmon run?

    a. If yes, what do you believe to be the cause of the decline?

    b. Do you ever take kings home for subsistence? How many do you like to have for a season and have you been getting your target number in recent years?

15. What do you think the managers and biologists believe is happening with the Chinook salmon stocks?

16. What do you believe should be done to preserve and/or rebuild the Chilkat Chinook salmon stocks (in terms of both management and biology)?

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17. Have you ever subsistence fished for crab in the Upper Lynn Canal?

18. How do you feel about the crab populations in the area?

    a. If you do not believe that the crab are doing well, what do you think should be done to preserve the crab populations (management and biology wise)?

REGULATIONS AND COMMUNITY:

- How have you been involved in State Board of Fish regulatory changes?
- Are you involved in the fish and game advisory committee?
- Why do you continue to live in Haines?
- What do you see for the future of the Haines economy?